INFORMATION AND COMMUNICATION TECHNOLOGY (ICT): ITS USE IN TEACHING STUDENTS WITH LOW VISION IN SECONDARY SCHOOLS IN MUKONO DISTRICT, UGANDA

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DECLARATION

I, **Mukhwana Michael,** do solemnly declare to the graduate board of Kyambogo University that this thesis is my original initiative and deliberate effort and that no part of it has been submitted for another degree in this university or any other institution of higher learning for the same award.

Signature: …………………………   ……..………………

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APPROVAL

The writing and presentation of this thesis was written following the guidelines on supervision of research projects laid down by Kyambogo University and it is hereby submitted to the graduate board with our approval as supervisors

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DEDICATION

This piece of work is dedicated to my family, especially my wife and friend, Alice Khakasa, daughters, Trudy and Tracy, not forgetting my mum, for their prayers and endurance during the entire period when I was away from them.

ACKNOWLEDGEMENT

declare that any weakness or mistakes that may be found in this report are my own and no one should be held responsible.

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LIST OF ACRONYMS

AT:	Assistive Technology
CCTV:	Closed Circuit Television
CRPD:	Convention on the Rights of Persons with Disabilities
DAISY:	Digital Access Information Systems
DBT:	Duxbury Braille Translator
GOU:	Government of Uganda
HAAT:	Human Activity Assistive Technology
ICT:	Information and Communication Technology
IMF:	International Monetary Fund
JAWS:	Job Access with Sound
LWVI:	Learners with Visual Impairment
MOES:	Ministry of Education and Sports
MoICT:	Ministry of Information and Communication Technology
NVDA:	Non-Visual Desktop Access
OCR:	Optical Character Recognition
PWDs:	Persons with Disabilities
PWVI:	Persons with Visual Impairment
SNE:	Special Needs Education
STEM:	Science Technology Engineering and Mathematics
SWVI:	Students with Visual impairment
UBOS:	Uganda Bureau of Statistics
UK:	United Kingdom
UN:	United Nations
UNESCO:	United Nations Education Scientific and Cultural Organization
WHO:	World Health Organization

ABSTRACT

The advancement in technology has revolved the teaching process world over making ICT one of the essential pedagogical tools for enhancing teaching for 'All'. There has been a gap between ICT as a subject and integrating adapted ICT resources as a pedagogical tool to enhance teaching across all disciplines for Students with Low Vision (SWLV). This study, therefore, examined the use of ICT in teaching SWLV in Secondary Schools in Mukono District, Uganda. The study was guided by objectives, namely; the nature of ICT resources; teacher preparation in ICT and the use of ICT in teaching SWLV. The study was guided by Human Activity Assistive Technology (HAAT) model as a theoretical framework to try and understand how ICT resources are used in teaching SWLV. A case study design of the qualitative approach was used. The target population for this study was the Secondary Schools teachers and SWLV who were purposefully selected to participate. The semi-structured interviews and observation methods were utilized in collecting the data. The data obtained were thematically analysed to derive meaning from them. The findings revealed that Secondary Schools barely had low-tech ICT resources while high-tech ICT resources were available but inadequate. The teachers had generic basic informal ICT training without specific training in adapting and integrating ICT resources in teaching SWLV while ICT is minimally utilized during the teaching process while science-based subjects were challenging to use ICT resources as a teaching tool and the biggest obstacle towards adapting ICT resources to teach SWLV is lack of sufficient specific training. The study concluded that schools had inadequate appropriate ICT resources for teaching SWLV; teachers were not adequately prepared to use ICT as a pedagogical tool while the level of ICT integration in teaching remains at an initial stage in Secondary Schools. The study, therefore, recommends that more appropriate ICT resources for SWLV be made available in Secondary Schools by the Ministry of Education and Sports (MoES) and other stakeholders. In addition, more in-service and preservice training opportunities for teachers in adapting and integrating ICT to teach SWLV should be accorded while collaborative practice between Secondary Schools should be encouraged.

CHAPTER ONE: INTRODUCTION

1.1 Introduction

This study intended to ascertain how Information and Communication Technology (ICT) influences the teaching of Students with Low Vision (SWLV) in secondary schools. This chapter comprises various key components which include: background, statement of the problem, purpose, objectives, research questions, the study scope, and significance of the study. The literature that has been used in this study such as policies may be generic, referring to people with disabilities and or Visual impairment in particular but relevant to SWLV since they are a subsection of persons with visual impairment. The focus on ICT is both inside and outside the classroom.

1.2 Background of the study

ICT has tremendously changed the practices and procedures of nearly all spheres of life in the last two decades. ICT consists of all technical means used to handle and facilitate the acquisition, storage, processing, transmission, and dissemination of information and aid communication in all forms including textual, voice, data, graphics and video (Cacavs, Bulent & Punar, Karaoglan Bahar, 2009). ICT is also described as anything that has to do with communication and or transmission of information (Jenko & Zupan, 2010).

The UNESCO policy model for inclusive ICTs in education for PWDs (2014) defines ICT goals at 3 levels: first, at a system level where ICTs are seen as a tool to widen participation and increase educational opportunities and inclusion for learners with disabilities (LWDs); secondly, at organizational level where educational Organizations and all professionals working with them (PWDs) are effectively supported to use ICT to increase participation and learning opportunities;

and thirdly, at a learner's level where inclusive ICTs are used as a tool for supporting learners to participate in inclusive education and personalized learning opportunities (Estévez et al., (2016).

In education, the role of ICT has become more significant especially in enriching instructional strategies (Syed, 2016). The "Education for All" (EFA) crusade obliges all stakeholders to ensure every learner accesses quality education (Unicef, 2007). In this endeavour, ICT has turned out to be inevitable in supporting "All" students including SWLV to realize their right to education and therefore, ICT is no longer a privilege but a human rights issue for 'All'. This implies that teachers ought to make use of this facility to support SWLV to realize their right to education (Stendal, 2012). Stendal adds that ICT holds great promises for persons with Low Vision as it can mitigate or eliminate several barriers which would otherwise impair their participation in day-to-day activities including school activities involving teaching. Although this study is not focused on Inclusive Education, the UNESCO policy model for inclusive ICTs in education for PWDs (2014) ultimately relates well with the use of ICT as a pedagogical tool in teaching SWLV.

ICT tools such as a computer can be effective tools for SWLV as they can counterbalance their disability and allow them to participate in a host of activities such as access to reading and writing in all accessible formats thus fostering communication at a school level. Besides, SWLV can highly benefit from tools such as electronic talking encyclopedia and dictionaries, screen readers, audio recorders and magnifiers (Dini et al., 2007). In this era, ICT offers a wider platform for communication from which SWLV ought to benefit from, and as a result, increase participation and acquisition of knowledge and skills.

In this study, ICT is used to refer to an umbrella term that comprises any electronic communication device or equipment and assistive technology encompassing audio recorders, cellular phones, computer hardware and software, satellite systems such as the internet and any other multimedia equipment/material and applications used to access, present, store and retrieve information and provide a communication platform for teachers and SWLV. The main focus of this study was its use as a tool and medium for teaching SWLV.

Globally, the advancement in technology has been swift, rendering the use of ICT in service delivery including teaching very crucial (Rony, 2017). Rony points out that with the world changing rapidly into digital media and information, ICT is seemingly performing a dynamic role in classroom practices including making teaching more effective and efficient the world over. On the other hand, adapting these technologies to suit the needs of SWLV has been ongoing and is of great advantage in bridging the gaps from classroom practices to the rest of their lives outside the school. In this digital era, ICT advancement provides new options for teaching, which give both teachers and SWLV opportunities to have access to information, lessons or classes from various resources (Hussin et al., 2013). Hussin et al., add that ICT devices and programmes such as electronic digital talking textbooks, speech synthesis, and screen readers; can be vital assists to SWLV in overcoming learning challenges.

There were 285 million people with visual impairment globally by 2010 and 90% live in low-income countries whereas 246 million have Low Vision. About 17.5 million of the above population, were of ages between 0-14 years while 74.4 million were of 15-49 years. The prevalence of low vision is 3 times higher than that of blindness (Pascolini & Mariotti, 2012).

Low vision is a permanent visual difficulty presenting visual acuity of less than 6/18 but equal to or greater than 3/60 or a visual field of less than 10^0 (radius) of the visual field from the point of

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fixation in the better eye after best correction or treatment or surgery (World Health Organization (WHO) (1992) classification of visual impairment (Vijaya et al., 2014). A person is said to have Low Vision if he/she has visual difficulties after treatment/surgery or standard refractive correction with a visual acuity of less than 6/18 or less than 10^0 (radius) of the visual field in the better eye but who uses or is potentially able to use vision to plan and execute tasks.

In this study, SWLV has been used to refer to a person who has irreversible or reduced vision loss but uses or is potentially able to use his/her remaining sight to participate in school activities that require vision.

It is recognized worldwide that adapted multimedia ICT educational resources play an important role in supporting the teaching and learning of SWLV (Dini et al., 2007). They further argue that a computer, for instance, is considered an effective tool for these students as it can counteract their disability by allowing them to perform a host of activities including reading and writing of all texts in accessible formats thus, fostering communication and learning. Similarly, ICT plays an important role in teaching as it gives opportunities for teachers to design meaningful experiences (Eady & Lockyer, 2013). However, it is important not to use ICT for its own sake rather it should be appropriately embedded in teaching.

Notwithstanding, ICT has brought hope to students with visual impairment including SWLV as it offers them opportunities to access learning and educational materials they previously could not access including talking books (Venezky, 2004). It is noted that the World Wide Web (www) has created a revolution in the use of ICT in classroom teaching of SWLV the world over by creating virtual learning communities of teachers and students to access and use a large portion of information resources including talking books.

ICT in teaching SWLV is supported by several international instruments: first, the Convention on the Rights of People with Disability (CRPD) 2006, article 3 and 4 state the obligation to provide accessible information to persons with disabilities State parties; article 9 (b) obliges States to take appropriate measures to ensure access on an equal basis with others to information, communications and other services including electronic services; article 21 (a) provides for PWDs a right to freedom of expression and opinion through access to public information in accessible formats and technologies for different disabilities whereas article 24 emphasizes that people with disabilities have a right to education without discrimination and based on the equal opportunity (Pillay, 2014). This implies that access to information is vital for education and teaching in particular, and in this case, having SWLV facilitated to access curricula activities using appropriate ICT resources. Besides, The Marrakesh Treaty of 2013, advanced by the World Intellectual Property Organization (WIPO), Article 1 obliges States to ensure that literary and artistic works in form of text, notation and or related illustrations, whether published or not be made available in accessible format copy or alternative form to persons with visual impairment or otherwise print disabled (Kaminiski & Yanisky, 2013).

ICT in the UK has recently become an integral part of the day-to-day learning experiences of SWLV. ICT tools such as virtual learning libraries, reliance on internet applications including e-learning and e-mail have increasingly been adopted for independent student study. In this regard, SWLV interface with ICT resources on a one-on-one basis as a way of facilitating access to information with support or no support from teachers (Livingstone, 2012). Therefore, utilization of ICT in teaching is premised on aiding the presentation of information to students in a more appropriate format; promoting independent learning including searching for information

from internet sources; and encouraging the use of electronic communication sources to send and receive information between teachers and SWLV (Tondeur, VanBaak & Valcke, 2007).

In Chile, the application of ICT as an innovation in pedagogical practices in primary and secondary schools was initiated in the early 1990s (Hinostroza, 2002). Hinostroza further elaborated that this initiative saw 70% of public schools receive computers, educational software and free and unlimited internet access to educational content relevant to the country's curriculum. However, it should be noted that it was meant to benefit the general student population and there were no specific adaptations mentioned in the innovation to specifically benefit SWLV during teaching.

In Malaysia, ICT has been used in schools to aid teaching and learning since the 1990s with the establishment of the Malaysian Smart School, an institution meant to reinvent teaching and learning practices to prepare students for the information age (Hussin et al., 2013). The Malaysian government also promoted ICT literacy in schools by equipping each school with a computer laboratory. Most importantly, the provision of digital talking textbooks for primary and secondary schools in 2009 and 2013 respectively, was a crucial consideration of the diverse needs of students especially those with Low Vision (Hussin et al., 2013). They further noted that the digital talking textbooks covered subjects such as English, Islamic Studies, Geography, History and Moral Education thus, indicating that SWLV had an opportunity to access information on the same content provided in a more adapted and accessible format during instruction.

For the case of Finland, ICT infrastructure in schools is quite good and a specialist teacher to provide technical support to both teachers and students employed (Tokareva & Turner, 2011).

They note that this development has given teachers and SWLV relatively good access to and use of ICT in accessing information for educational purposes. They further added that the initiative has been enabled by a collaborative strategy of the Department of Special Needs Education, University of Eastern Finland and Honkalampi Foundation

The use of ICT in teaching SWLV in Grenada (one of the Caribbean countries) started in 2004 with students provided with assistive technology and devices such as Braille printers, specialized keyboards, magnifiers, audio recorders and software such as screen readers and text to audio converters (Tokareva & Turner, 2011). They further pointed out that the support has enabled students with visual impairment including SWLV to participate in learning activities in mainstream secondary schools and consequently, it has improved their self-concept as well as self-esteem and on the overall, their academic achievements.

In Africa, there has been a growing interest and commitment to ICT, especially by the disability movement for use in the teaching process and improving the quality of life for SWLV (Belay, 2005). In South Africa, the use of ICT for pedagogical practices of SWLV is more pronounced in higher learning institutions. The students have access to digital enlargeable (zoom text) and voice synthesizable library books, computer monitors with adaptations in font size and colour contrasts as well as the internet are among the ways they access information for purposes of participation in learning (Mokiwa & Phasha, 2012).

In Kenya, there have been initiatives in promoting the use of ICT in Secondary Schools. For instance, school broadcasting programme for curriculum content using World Space Technology for 3000 secondary schools, digitization of curriculum content for schools by Kenya Institute of Education and purchasing of computers for 142 schools by 2006 (Hennessy et al., 2010).

Specifically, SWLV are trained to use ICT devices such as electronic magnifiers, recorders and electric lamps as a means of enabling them to access and participate in teaching-learning activities (Kiare, 2004).

Uganda's initial ICT policy guidelines of 2003 recognize and embrace the goal for lifelong education for "all" with specific strategies including integrating ICT into mainstream curricula as well as other literacy programmes to provide equitable access for all students regardless of the level of education; and developing and managing ICT centres of excellence to provide basic and advanced ICT training in secondary schools, (Farell, 2007).

Relatedly, the ICT policy of 2014 section 5.2.3, emphasizes the revision of primary, secondary and tertiary level curricula to pedagogically integrate ICT in teaching and learning process; impart necessary ICT skills in teachers as the cornerstone in implementing the use of ICT resources in teaching; create opportunities and provide assistance for the disadvantaged including people with special needs (*Ministry of Information and Communication Technology [MoICT],* 2014). In this case, people with special needs are SWLV and this policy implies that teachers have to be prepared to use ICT resources to teach them whereas the schools have to be fully equipped with appropriate ICT resources to enable SWLV to benefit during the teaching process. The Persons with Disabilities Act (as amended) (2019) article 15 subsection (b) states that government has an obligation to promote the use of information assistive devices and technology suitable for learners with disabilities and other special needs (*Government of Uganda [GOU],* 2019).

In the National Development Plan of 2010/2011-2014/2015, it was stressed that the government of Uganda was to construct and equip ICT laboratories in secondary schools as a basis for developing productive skills in students. Also, specific computer packages for students with

visual impairment including SWLV were to be installed in the laboratories (International Monetary Fund, IMF, 2010). There is no doubt that the government of Uganda through the Ministry of Education and Sports has been establishing ICT laboratories and equipping them with computers and other multimedia communication equipment in selected Secondary Schools all over the country, indicating that not all schools have benefited from this development and besides it is not mentioned anywhere to ascertain whether specific computer packages and programmes for SWLV were as well installed.

Uganda implemented the teaching of Computer Studies (now referred to as ICT) as a separate subject at the Secondary School level after 2007. Currently, it is examinable by the Uganda National Examinations Board (UNEB) at the end of 4 the years' cycle. It is also taught and examined at the Advanced level as a subsidiary. The main aim of teaching ICT at these levels of education is to equip students with computer skills to use ICT to enhance their productivity and development of creative skills. One aspect to note is that ICT is not taught in all Secondary Schools in Uganda but in those that have ICT infrastructure. By 2006, more than 300 secondary teachers had been trained in ICT and software maintenance; and upgrades for 6000 desktop computers were procured for secondary schools. (Hennessy et al, 2010; Farell, 2007).

Currently, there are 10 Secondary Schools in Uganda (9 with Units while 1 is a special school) enrolling student with visual impairment including those with low vision. Others are, however, studying from within the regular ordinary Secondary School settings. These students need ICT as a medium to have access to information during teaching while in most cases, they are urged to offer ICT as an alternative subject to sciences. The assumption here is that SWLV are ultimate beneficiaries as teachers teach using ICT as well as students using ICT resources.

The number of Persons with Visual impairment in Uganda as per the national population and housing census 2014 stands at approximately 2.1 million (6.1%) (*Uganda Bureau of Statistics [UBOS],* 2016). By 2017 however, the enrolment of students with visual impairment in Secondary Schools in Uganda was 4,020 accounting for 46% of the total enrolment of students with disabilities compared to 3,783 (44.5%) in 2016; 3,709 (47.8%) in 2015; 3,982 (48%) in 2013; and 6,275 (48.3%) in 2010 of the total enrolment of students with special needs in both government and private schools respectively. The number of computer laboratories in Secondary Schools which were fully installed and operational by 2017 was 1661 compared to 1,535; 1,455 and 1,378 by 2016, 2015 and 2013 respectively (MoES, 2017; MoES, 2016; MoES, 2015, MoES, 2013; MoES, 2010).

Reflecting on the above statistics, it indicates that there is a sizeable number of students with visual impairment in Secondary Schools in Uganda over the years while the number of ICT laboratories has over the years increased in number. It is also realized that the enrolment is generic and not disaggregated. However, based on international estimations by the World Health Organization (WHO) the number of SWLV in Ugandan Secondary Schools is estimated at ¾ of the total population of students with visual impairment.

Nevertheless, ICT use in Secondary Schools in Uganda remains to a large extent out of reach for SWLV as most schools are in the early formative phases of ICT adoption, characterized by unreliable provision and use.

This study was carried out in Mukono district which is one the oldest districts in Uganda with a total of 89 Secondary Schools of which 20 are government, 37 private and 32 community-based founded. The district also hosts one of the 10-unit Secondary Schools enrolling Students with Visual Impairment (SWVI) with SWLV inclusive.

According to my observations, SWLV in Secondary Schools level whose vision could still be enhanced through the use of appropriate ICT accommodations during the teaching process were subjected to the use of Braille just like their blind counterparts. This is done as the alternative mode of accessing information and/or communication and medium of instruction, especially for reading and writing. This may have an impact on the level of engagement during the classroom and out of the classroom.

Whereas the government's efforts to establish ICT laboratories in Secondary Schools has been ongoing and progressive in recent years, what was not certain was whether schools are utilizing these resources to facilitate the teaching of SWLV other than relying on traditional strategies such as Braille mode as a means of communication and access to information. It was upon this background that this study was conducted to attempt to link ICT to the teaching of SWLV in Secondary Schools.

1.3 Statement of the Problem

The use of ICT in teaching has become increasingly significant in the 21st century worldwide and offers great potential in teaching (Habibu et al., 2012). In Uganda, ICT is taught as a subject in Secondary Schools and an attempt to provide ICT laboratories has been made. However, there is a gap between ICT as a subject and integrating adapted ICT as a pedagogical tool to enhance teaching across all disciplines for SWLV (Nantongo & Hetland, 2020). Therefore, not much is known regarding this particular aspect of how ICT is used to facilitate the teaching of SWLV in Secondary Schools in Uganda to date. This study, therefore, sought to link ICT to the teaching of SWLV in Secondary Schools in Uganda.

1.4 Purpose of the study

The use of ICT has become inevitable for service delivery in all spheres of life. In education, it is taken as an essential component and as such widens opportunities for all students including SWLV to interact with their teachers and or learning environment/materials during the teaching process. In Uganda, ICT integration in teaching in Secondary Schools has been ongoing in the last two decades. The purpose of this study was to examine the use of ICT in teaching SWLV in Secondary Schools in Uganda.

1.5 Objectives of the study

This study was guided by the following specific objectives:

- To establish the nature of ICT resources that are used in teaching SWLV in Secondary Schools in Uganda.

- To establish how teachers are prepared to utilize ICT for teaching SWLV in Secondary Schools in Uganda.

- To explore how ICT is utilized to facilitate the teaching of SWLV in Secondary Schools in Uganda.

1.6 Research questions

To obtain the data, the following questions were used as a guide:

- What nature of ICT resources do schools have for teaching SWLV in Secondary Schools?

- How are teachers prepared to use ICT in teaching SWLV in Secondary Schools?

- How are teachers using ICT in the process of teaching SWLV in Secondary Schools?

1.7 Justification of the study

In the recent past, data concerning how SWLV have benefited from the ICT policy established by the Government of Uganda has not been clear even when the number of SWVI including those with low vision has been growing in Secondary Schools in Uganda. There has been a growing trend towards the use of technology in every sphere of life for 'All' and therefore SWLV ought not to be left behind in this trend. Currently, there is limited literature concerning this kind of study in the Ugandan context with available studies surrounding only the accessibility of Assistive Technology (AT) but not specific to the use of ICT as a pedagogical tool.

Many SWLV in Ugandan schools have always been subjected to Braille as a medium of communication especially in the process of accessing information during teaching sessions yet some of them could benefit from ICT products and/or devices.

1.8 Scope of the study

This section presents the content scope, geographical scope and time scope:

The study has been restricted to exploring the use of ICT in the teaching of SWLV in Secondary Schools both in and out of the classroom situation by probing the nature of ICT resources in schools, the preparation of teachers in utilizing ICT as a teaching tool and how it is being used by both teachers and SWLV in the teaching process.

The study was carried out in one Secondary School located found in Nakisunga Sub-county, Mukono District, central region of Uganda. This school was chosen because it is a regular Secondary School with a Unit for students with Visual impairment (SWVI) thus those who are

Blind and Low Vision students are expected to be beneficiaries of ICT resources. The study took one year from August 2019-September to, 2020.

1.9 Significance of the study

It is hoped that the findings of this study may: cognizant

Help to enlighten the educators on how ICT as innovation can be adapted to facilitate the teaching of SWLV in secondary schools and any other level of education.

Provide useful feedback to the MoES and other stakeholders for purposes of policy formulation, planning, developing and providing appropriate ICT resources to Secondary Schools in the country.

Help to identify challenges faced by schools in as far as the application of ICT to facilitate the teaching of SWLV is concerned and thus act as an eye-opener to stakeholders including MoES, school administration and teachers, in particular, to find remedies to the aforesaid challenges.

Contribute to the already existing literature as a source of knowledge and/or information for further research in a similar area in the future.

1.10   Definition of operational terms

Underlined are the operational terms:

Assistive technology (AT): is a generic term referring to any product, devices, equipment, and software either specially designed and produced or generally available, whose main purpose is to maintain or improve an individual with low vision's functioning and independence in performing instructional activities which would otherwise have been difficult or impossible (Desmond et al., 2018). AT in this study has been to refer to the electronic ICT resources used in the facilitation of the teaching and learning process for SWLV.

Pedagogical tool: this is a device or instrument that is used to promote interaction between the teachers, students and the learning environment and the learning tasks during the teaching process (Murphy, 2008). The pedagogical tool in this study refers to the ICT resources being utilized as teaching aids to facilitate student's learning.

Resource room: this is a special facility where special materials and equipment tailored towards the needs of SWLV are kept and also where specialized skill training takes place (Deshpande, 2013). This term has been used to mean the specialized room where ICT equipment are kept for SWLV.

Teacher preparation: in this study, this concept has been used to refer to the way teachers are trained to gain knowledge and skills necessary for manipulating and or using ICT as a pedagogical tool.

Teaching: this is an interactive and cooperative process between the teacher and the students to facilitate the active construction and transmission of knowledge, skills and values by students (Ramírez et al., 2015). Teaching has been used to refer to the process in which teachers interact with SWLV to facilitate access to curricula activities both within and outside the classroom situation.

Visual impairment: this is a condition in which a person has difficulties in sight rendering the performance of visual tasks difficult. In the context of this study, the term visual impairment has been used to refer to low vision.

1.11 Theoretical Framework

This study was guided by a rehabilitation model known as The Human Activity Assistive Technology (HAAT) model, which was proposed by Albert Cook and Hussey in 1995. HAAT is

an improvement of Bailey's Human Performance model of 1989 which was later reviewed by Albert M. Cook and Miller Janice Polgar in 2008 (Giesbrecht, 2013). This model was developed to guide the selection, assessment and decision making on the design, and the prescription as well as evaluation of the result of an Assistive Technology system (AT). Cook and Polgar argue that the outcome/result of the AT system is complete when a person with an impairment doing some activity within a given context. The model advocates that AT services must be centred on the individual with a disability, having the primary consideration of improving the performance of a person (Cook & Polgar, 2008).

The HAAT model presents a theoretical framework that defines basic factors that affect the use of AT. The determination of the process of AT suitability is based on the four main key components in which none functions in isolation (Cook & Polgar, 2008).

The first component is the "Human" who controls many intrinsic factors (sensors, central processing and effectors) as well as the skills and abilities which in turn produce an outcome;

The second component is the "activity" which refers to the performance areas such as self-care, daily living, school, work activities, leisure/play or goal to be achieved by the AT may be affected by intrinsic and extrinsic enablers. It represents the functional result of human performance and it is paramount to the individual and in this case having a SWLV successfully accesses information during the teaching process. The third one is the "AT" which are taken as extrinsic enablers like the equipment which an individual with a visual impairment uses to engage in a given activity; and the last component is the "context" (setting, social context, cultural context and/or physical environment) in which the person lives. In the educational perspective, it refers to where the activity takes place and each of these aspects play crucial roles in the ultimate effectiveness or ineffectiveness of the AT system. For instance, social and cultural

contexts describe salient aspects of both interaction and acceptance of AT in an educational setting such as school policies, attitudes of teachers and peers towards a SWLV in using AT, specialist teachers to offer services; the location of the school; the physical context includes, classroom arrangement, dimensions of doors and postural support.

The emphasis of this model is on the activity while the activity performance is at the centre within the assistive technology system which serves as the component as well as the outcome. The AT technology is therefore seen as an external factor that enables a user to perform a desired activity and the dynamic interaction between the first three factors are influenced by the context. Several scholars have made use of this model in the rehabilitation of persons with disabilities in the following ways:

In the study on using AT to facilitate play for children with motor impairment, HAAT model was used a basis to evaluate the general performance of play activity (Besio, 2004). In this study, the context under which play as an activity took place became the driving force in determining the choice and modification of the computer accessories as well as the activity. Besio further observes that the child's cognitive abilities, motivation and participation levels were very important in determining the use of the computer access device as an AT.

Akyurek et al., (2017) used the HAAT model in describing how the context/setting in terms of the physical environment such as the home, school, workplace; governing policies; socio-cultural context (family, peers and strangers) determines the design, development and guidance in AT and services for persons with disabilities. They further observe that while using HAAT in education, it is important to understand and consider the educational activities in which the user is likely to engage before designing assistive technology as these factors can either facilitate or inhibit its use by the person.

Kouroupetroglou (2015) used HAAT model in a study on Text Signals and Accessibility to Educational Documents to explain the accessibility to text-content of a document as well as the text signals. This was purposely done to enable an electronic document, either in the form of a common file format (such as .pdf .doc, .ppt) or a Web document, to be used effectively, efficiently and satisfactorily accessed by more users in more situations or context including accessing during the teaching process. Reference to the Context-sensitive User-centered Scalability, the HAAT theory was adopted to make considerations of modifying the games of elderly workers as a means of counteracting the effects of health problems/complications (Gobel et al., 2012). They further argue that elderly workers are considered valuable due to their experience and accountability. However, many of them retire earlier than expected due to health complications. The study used the "context" which is one of the components of the HAAT model to design and adapt games (activity) software called exergames and production wizard, as a support technology system at both sports and work contexts to meet the competences of individual users.

In the study on App-based Mobile Devices (AMD) in occupational therapy, HAAT model was applied in evaluating client factors and contextual considerations in using Mobile Devices such as smartphones, tablets and e-readers in improving the performance of client (Erickson, 2017). Erickson observes that before implementing the AMD, the activity to be carried out and the AT devices or app must be evaluated. Thus, Erickson concludes that gathering information about the prospective activity and AT devices is consistent with the HAAT model which seeks to identify the activities the person considers necessary. Besides, the HAAT model was earmarked to offer an explanation that a person requires physical, cognitive and emotional skills to operate any assistive technology including the strength, perceptual skills to perceive information using AMD.

The relevance of the HAAT model to this study

This model resonates well with this study in a way that the 'Human', who in this case is the teacher and the SWLV has to interface or interact with the ICT resources available in the school setting to enhance his/her participation and engagement in learning activities at school as the context in which he/she operates from. Although not all ICT resources are AT, in this study adapted electronic ICT resources represent the AT referred to in the HAAT model which may include electronic high-tech and low-tech ICT resources. These ICT resources are meant to act as external enablers in aiding SWLV to access curricula activities during the teaching process. The SWLV and or the teacher has to be knowledgeable and skilled (physical, cognitive and emotional) in using the ICT resource/facility to facilitate the teaching process.

The expertise of the teachers, in this case, is paramount in influencing the adaptation and use of ICT resources in their teaching including the presentation of information and by SWLV to enhance their learning (Cook & Polgar 2008). For example, the preparation of teachers and SWLV in using available ICT equipment is quite important as it culminates into SWLV utilizing ICT to facilitate their learning. Additionally, the type of school activity of engagement by the SWLV has an implication on the kind of ICT resource to be used. Activities such as reading, writing, independent mobility and orientation, leisure activities including games may require different adaptations in ICT resources to enhance the teaching of SWLV in a school setting.

Relatedly the context under which the teachers and or SWLV use the ICT resources in Secondary Schools significantly determines the teaching-learning outcomes. The physical environment, for example, needs to be accessible and appropriate including well-lit classrooms and compound, ramps and walkways for accessing learning facilities, and the location as well as the arrangement of seats and ICT equipment in classrooms; the social and or the cultural context

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including the attitude of teachers and SWLV towards the use of ICT as well as the perception of other ordinary peers towards SWLV may determine how well ICT resources are applied in the teaching process; an institutional policy on the access and use of ICT resources has an implication too. For instance, a policy that permits school procured ICT equipment to be taken home by SWLV increases his/her opportunities to complete homework and apply communication skills in the community as well (Cook & Polgar, 2008).

HAAT model is also very categorical on the nature of AT available to choose from. In this particular study, the kind and availability of ICT resources/facilities in Secondary Schools has an impact on the teaching of SWLV and consequently determines the learning outcomes. If teachers and SWLV have access to adequate and appropriate (adapted) ICT facilities, which in this case act as assistive technology (AT), the teaching and subsequent participation in learning activities are likely to be enhanced.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the literature review on related empirical research studies carried out to explore materials related to the present study. The purpose is to identify ideas and findings generated by different authorities from different parts of the world that would enable the researcher to gain insights necessary for the effective solution(s) to the research problem at hand. This has been done based on the study objectives formulated in chapter one which includes; the nature of ICT resources in schools; the preparation of teachers in using ICT; and how ICT is used in teaching SWLV.

2.2 Nature of ICT resources for teaching SWLV

The nature and availability of ICT resources in Secondary Schools determine their accessibility by teachers and SWLV for use in the teaching process. With the advancement of technology, adapted ICT devices, software or programmes have been invented to support the teaching of SWLV in Schools. Therefore, this subsection presents the literature search from empirical studies about the nature of ICT resources available for SWLV.

Douglas et al., (2011) carried out a study on Access to print literacy for children and young people with visual impairment. Findings from the study cite ICT resources such as Closed Circuit Television (CCTV), computer magnification software, screen-reading software as very useful in enabling low vision print readers to establish optimal print size or alternative means to access print text materials provided in soft copy during teaching. These ICT resources mentioned above provide access to information in appropriate formats especially by enlarging font sizes of text materials and given an audio output of word documents displayed on computer screens.

Eligi and Mwantimwa (2017) observe that SWLV can use tape recorders, note taker, computers, special software like JAWS and Non-Visual Desktop Access (NVDA), talking watches, scanners and CCTV as appropriate electronic ICT resources to support them during teaching. However, findings also indicated that the ICT facilities are not having an adequate quantity of appropriate ICT resources as compared to the number of students. Similarly, a study by (Dini et al., (2007) indicates that ICT resources for SWLV include audio recorders, Perkins smart Braillers for Braille writing, CCTV, computers with specific software such as video magnifiers and screen readers with voice synthesis. Likewise, Shikden (2015) identifies computers, talking calculators and clocks as ICT resources available in schools for use by SWLV. Shikden's study findings also reveal that schools that had ICT resources were mainly low-tech ICT resources and high-tech resources were not readily available.

In a study by Wong and Cohen (2016) on access and challenges of AT application: experiences of teachers of SWVI in Singapore the findings identified relevant ICT resources for SWLV in form of high-tech resources including computers with inbuilt enlargement/magnification software, zoom text, Job Access with Speech (JAWS), CCTV and low-tech devices including table lamps, and photocopiers for enlarging materials.

In a study by Mathevula and Uwizeyimana (2014) entitled 'challenges facing the integration of ICT in teaching and learning activities in South Africa rural Secondary Schools, the outcome indicates that schools had scarce ICT resources for integration during teaching, with only television sets, photocopiers and computers available. It was further indicated that projectors were rarely used by teachers.

ICT resources necessary for supporting SWLV are Optical Character Recognition software (OCR) used in conjunction with a computer and a scanner to make texts from books, magazines or any other reading material transformed into speech accessible to SWLV who have severe low vision (Serero, 2011). Other ICT resources identified by Serero (2011) are computers with adapted keyboards, mice and cursor enlargers, interactive whiteboards and the internet for e-learning. This is aimed at promoting interaction among SWLV themselves and between teachers and SWLV.

ICT resources for SWLV are categorized into high-tech and low-tech resources (Erdem (2017, 2017; Sah, 2013). High-tech resources use complex, multifunction technology and usually include computer and associated software. They include computers and associated adapted software such as screen readers which covert electronic texts into speech, screen recognition software which allows input of data using a voice other than mouse/keyboard and screen magnifiers (zoom text) for presenting enlarged screen content; PowerPoint projectors, smartphones, mobile telephone software like Google assistant, clear reader, and Optical Character Recognition software (OCR). Others are large monitors for enlarged view screens; large print keyboards with contrast colours (alternative keyboards), scanners for converting images from print material to computer file which can be converted into other accessible formats and CCTVs among others. The low-technology ICT resources are those that are electronic but do not include highly sophisticated and advanced components. These may include devices like electronic voice/audio recorders, audio players, talking calculators with large print/keys, table lamps, and hand-held electronic magnifiers. They urge that these ICT resources are compatible with SWLV and can be utilized during their instruction.

Mulloy et al., (2014) identify interactive boards like Promethean boards for the display of computer image making it accessible to users directly, voice recorders for recording lessons and assignments as well as adapted calculators with large keys, high contrast screens, lamps for increased illumination as potential ICT resources. They argue that teachers and SWLV need to make use of these ICT resources during the teaching process.

Hussin et al., (2013) add that CCTVs, talking books through computers, moving pictures experts group Audio Layer 3 (MP3) players for playing digital books and the internet are more acceptable, effective and accessible ICT resources for teaching SWLV. They also indicate that the internet is used by SWLV to browse and find all sorts of information including additional notes and supplementary materials in subjects learnt in the school.

Eguavoen (2016) carried out a study and observes that majority of the Students (78.6%) apply smart mobile phones while a few made use of personal computers as well as e-learning platforms including internet implying that ICT resources which are most likely to facilitate teaching them are either not available for them to use or not accessible.

Andoh (2012) observes that access to ICT infrastructure and resources in schools is a necessary condition for ICT integration in education. Andoh further explains that effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware and software. Andoh elaborates that if teachers cannot have access to ICT resources, then they will not use them. This argument implies that it is not just enough to have adequate and variety of ICT resources in the Secondary Schools but rather making these resources accessible to teachers and SWLV so that they can use them to access learning materials during the teaching process.

On the other hand, Bingimlas (2009) observes that most of the schools do not have access to broadband internet access, inadequate computers coupled with an insufficient number of adapted educational resources which would be helpful in the teaching of SWLV in Secondary Schools. Equally, Yusuf et al., (2012) reveal that majority of the institutions did not have the required ICT equipment for students with disabilities including SWLV. They further argue that most of the equipment available was outdated and that some of the schools had computers but used them for administrative purposes other than for instruction. Likewise, Majinge & Stilwell (2014) observes that libraries did not have adequate and appropriate adapted ICT resources available for persons with visual impairment including SWLV to use for study purposes.

From the discussion above, it is categorically indicated that ICT resources for SWLV are available on the market both low-tech and high-tech devices and technologies. It is also pointed out in the review that schools are mostly equipped with low-tech ICT resources despite the existence of high-tech ICT resources. There is, therefore, a general representation indicating that schools are still grappling with inadequacies in stocking adequate and appropriate ICT resources for teaching SWLV. However, it should be noted that ICT in the 21st century has become indispensable in all service delivery and teaching SWLV is not an exception. Gone are the days in which SWLV have to depend mainly on reading and writing using Braille even when a significant number of them have some form of functional vision and could benefit from large print materials and technology of which ICT resources can be handy in such circumstances (Sah, 2013). Secondary schools ought to put in place ICT infrastructure as well as equipment meant to support the teaching of SWLV. On the other hand, SWLV should be encouraged and trained to use ICT resources available as a way of enhancing their learning.

The biggest gap which has been identified in the review above is that there has not been any localized research study undertaking to highlight the kind of adapted ICT resources in form of equipment and software available in Secondary schools in Uganda. Most of the literature is therefore from foreign countries whose level of development may be above that of Uganda. In an attempt to address this gap, the study focused on establishing the nature of adapted ICT resources that are available and at the disposal of teachers and SWLV to use during the teaching process in Ugandan Secondary Schools.

2.3 Preparation of teachers in using ICT to teach SWLV

The quality of education and training of SWLV largely depends on the quality of teachers; that is an academic qualification, professional training, commitment and dedication (Mugambi, 2011). Uganda is currently embracing ICT as an integral tool in all service delivery and teachers are central to any successful implementation of such an educational innovation/change and therefore, ICT is not an exception. Teachers' preparedness in teaching SWLV as well as ICT utilization as a pedagogical tool in teaching is a litmus paper in determining the quality of learning by SWLV in this recent generation. Some empirical research studies have been reviewed in line with the aforesaid as follows:

The study carried out by Bingimals (2009) on barriers to the successful integration of ICT in the teaching and learning environment shows that teachers have a strong desire to integrate ICT into the teaching of SWLV but are encountered by barriers including lack of confidence and skills. Bingimals further adds that access to ICT resources might be available but teachers cannot use them in the classroom to support teaching SWLV because it is difficult for them to operate ICT resources as well as enable SWLV to use them. The study thus recommends that providing

effective pedagogical training for teachers rather than training them to use ICT tools is an important parameter in enabling its integration in teaching SWLV.

The role and expertise of teachers are very critical because they are at the front line of designing and delivering learning experiences (Eady & Lockyer, 2013). They further argue that just making ICT available in schools does not mean that teachers will make use of it nor can it be necessarily be used efficiently. This argument is true because the teachers must possess some sort of knowledge and skills in adapting ICT resources so that they can use them in the teaching process. The availability of ICT resources in a school ought to match the teacher's abilities in using them in their pedagogical engagement.

In a study carried out by Msila (2015), findings point out that many participants (teachers) felt inadequate in applying ICT and without proper training, any attempt to utilize ICT in teaching can embarrass and expose their inadequacies in the classroom before students. Msila further elaborates that ICT competence is highly linked to training including continuous professional development and attitudes, as pertinent ingredients towards the success of its instruction, application and thus concludes that any innovation in education including ICT needs skilled teachers.

In the study carried out by Mathevula and Uwizeyimana (2014), it was found that the majority of teachers did not have professional qualifications in ICT and those who had training had basic training. This had an impact on their abilities and confidence to use ICT in the instructional process of all students including SWLV. They further observe that ICT requires the emergence of new skills, attitudes and pedagogical approaches through continuous training programmes to build adequate capacity among teachers. This study identifies the following as important skills and abilities in ICT: managing files and databases; sending and receiving emails; communicating

using digital tools; organizing tools to connect their classrooms; and presenting information using projectors, videos and podcasts.

Similarly, numerous factors influence teachers' use of ICT. Teachers' knowledge and attitudes influence their use of ICT in teaching (Andoh, 2012). The findings illustrate that teachers' attitudes towards technology influence their acceptance of the usefulness of technology and its integration into teaching. If teachers' attitudes are positive toward the use of technology, then, they can easily provide useful insight into the adoption and integration of ICT into teaching processes.

Some of the barriers that Tokareva and Turner (2011) highlight to using ICT are negative attitudes and limited ICT training. They emphasize that digital competence is one of the key aptitudes in the new skills especially in the use of ICT equipment and digital content and tools in teaching for learning. Tokareva and Turner observe that the purpose is to enhance digital skills and literacy for improving accessibility by SWLV. They assert that dedicated staff development and training in ICT to ensure that teachers have the necessary knowledge in the use of ICT for pedagogical purposes as a means of addressing the unique needs of SWLV is a prerequisite.

Other barriers that Jo Shan Fu & Fu (2013) reveal is lack of in-service preparatory training on the use of ICT including lack of specific knowledge and abilities in customizing and integrating ICT as well as combining it with existing pedagogical content knowledge to support SWLV during instruction are major obstacles to ICT integration in teaching. They, therefore, recommend that teachers should be provided with timely continuous professional development training including workshops to allow them to reflect upon strategies concerning ICT integration into instruction. This is also aimed at enabling them to update or upgrade their knowledge, and skills and obtaining technical support when needed. They also suggest that supporting

partnerships among teachers that help teachers share ICT practices and experiences as a way of making them prepared to manage technology-rich teaching is very crucial in this regard.

A study by Şimşek et al., (2010) also reveals that most of the teachers (trainers) who were training SWLV in using ICT as assistive technology (AT) had only attended a course on how to teach Students with Visual impairment (SWVI). The training, however, did not sufficiently prepare them to teach SWLV using ICT as an AT in the form of a pedagogical tool. They, therefore, observe that teacher preparation programmes ought to include arrangements for ICT training as a capacity-building strategy. Additionally, computer technology skills as part of the additional curriculum for SWLV are emphasized as a means of providing access to the curriculum during teaching (Douglas et al., 2011). This, however, has to correspond with teachers' training needs so that they can teach access skills to SWLV in ICT devices to optimize their access to print materials and this is taken as a long-term strategy of enabling them to have access to curriculum activities during teaching.

The above argument is to a large extent true because there is no way SWLV can be able to utilize available ICT resources in Secondary Schools if they are not supported by teachers through training. Nevertheless, this training can only be done if the teachers are as well proficient in using the same ICT resources at their disposal.

Zhou et al., (2011) study indicate that the majority of the teachers (74%) reported having a significantly lower level of knowledge and skills than they ought to have in ICT, indicating dismal knowledge and skills to use ICT as AT for pedagogical purposes. They further observe that the teachers were also less confident to use ICT in teaching SWLV in their classes. This had an impact on their teaching and therefore needed the training to fulfil the requirement of teaching SWLV. Equally, Shikden (2015) study shows that only 0.07% of the teachers were experts in

using ICT resources (devices) while a higher number of teachers either had no experience or were at the level of a beginner or novice in using ICT as an AT to teach SWLV. This indicates that most of the teachers were not proficient in teaching SWLV using ICT resources. Shikden further points out that the lack of training, ICT resources and/or competence in using ICT are the main factors responsible for this trend. In response to the above, Hussin et al. (2013) recommend more in-house (school-based) ICT training for teachers so that teachers can use more advanced ICT technologies to facilitate the teaching of SWLV.

Siu and Morash (2014) in their study observe that most teachers had good proficiency in using ICT as an AT for instruction and that deficit in the proficiency of teachers in ICT negatively impacts SWLV's ability to use ICT in their learning. They also argue that the proficiency of teachers in applying ICT is determined by their level of pre-service as well as continuous ICT training. They, therefore, recommend increased pre-service training as well as embedding ICT in teacher training programmes as a strategy to adequately prepare teachers to teach SWLV in schools.

Wong et al., (2016) carried out a study and point out that the teachers were aware of low and high-tech ICT devices but did not have working knowledge and skills (expertise) of the equipment and therefore had no clue on how to integrate them in teaching practices. They also note that the majority were hesitant to reveal their skills but admitted that they had limited knowledge and skills while others were using SWLV who were in the know of ICT to apply it in their teaching. They as well report that teachers instead still relied on Braille literacy even for SWLV in teaching other than ICT. They further observe that the professional development of teachers in ICT for the entire school teaching staff is very critical.

Similarly, most educators do not have specialized and right qualifications to teach SWLV and most of them have not received some form of formal in-service training as far as identification, assessment and supporting SWLV is concerned (Serero, 2011). Serero further argues that much of the training was theoretical and did not prepare teachers to implement the knowledge in practice and this impacts their ability to identify appropriate ICT resources for teaching SWLV. Serero reveals that there was a disparity in the preparation of teachers of which those in rural special schools had received training in Braille other than ICT while those in urban areas had some training in ICT use. The study, therefore observes that utilizing ICT as a pedagogical tool has consequences on the side of teachers' training needs. Likewise, Adegbenro et al., (2017) assert that it is essential that teachers receive training in ICT to be able to fully integrate ICT in their teaching practices.

Teachers have problems in the use of various ICT devices for SWLV in terms of setting them up for teaching for learning purposes and are not confident enough to teach SWLV though they had trained in Special Needs Education (SNE) (Mugambi, 2011). Similarly, Tedla (2012) reports that teachers are not knowledgeable in ICT usage as most revealed that they had never taken any training on ICT. Tedla further explains that ICT usage is highly dependent on teacher's characteristics including skill and confidence. Thus, they require ICT training at both pre-service and in-service levels. Equally, Ramos and de Andrade (2016) in their study findings indicate that teachers had confidence in ICT capabilities. They were, however, found with less resourcefulness in some of the ICT tools and software specific to low vision with a substantial number of teachers ignoring to use many of these ICT tools. They further account that the lack of specific training is considered to be the main impediment for teachers regarding the full integration of ICT in teaching their SWLV.

The literature search above points out the fact that teachers' preparation in the utilization of ICT as a pedagogical tool for teaching SWLV in Secondary Schools is highly valued in high esteem. Therefore, all efforts should be made to have knowledgeable and skilled educators with the right professional attitude. It also implies that teacher preparation programmes must, therefore, in this case, equip teachers with the necessary knowledge, skills, and motivation on a variety of AT including ICT beforehand and continuously so that they are enabled to apply ICT in teaching SWLV.

Whereas the studies have tackled the pertinent issue about preparedness and or level of proficiency by teachers in applying ICT resources in teaching, many of them fall short of being specific to addressing teachers' specific resourcefulness in adapting and integrating ICT usage to teach SWLV and were generic encompassing all SWVI to some extent. However, this current study intended to explicitly limited itself towards teachers' preparedness in adapting ICT for the instruction of SWLV in Secondary Schools, as a way to address the gap.

Likewise, some of the literature has had a lot of leaning to other levels of education especially institutions of higher learning by examining the training the levels of staff to support SWVI. This means that little has been tackled as far as teacher preparedness to adapt ICT resources to teach SWLV secondary education is concerned. This study however, focused on how best secondary school teachers are prepared to adapt and integrate ICT resources to support the SWLV during the teaching process in attempt to address this gap.

2.4 ICT as a teaching tool for SWLV

The advancement of technology and ICT, in particular, has come to live with us and we have no option other than to adopt this revolution and make use of it in the service delivery of SWLV including teaching. As earlier discussed, ICT has an enormous potential in enhancing the

teaching of SWLV in Secondary Schools and below are some of the scholarly studies that have advanced and or unveiled the value of ICT as a pedagogical tool.

ICT resources or equipment facilitate SWVI including those with low vision to access a vast amount of information while studying in class as well as leisure activities (Şimşek et al., 2010). Similarly, ICT resources such as CCTV, zoom-text for enlargement, phones especially smartphones, e-books, videos on YouTube, perform a very crucial role in compensating the impairment students have. SWLV can therefore manipulate such equipment according to their needs to increase their reading and writing skills including typing of notes for purposes of enhancing communication during the teaching process (Edgar et al., 2017).

Teachers use ICT resources especially the computers for typing their notes for teaching or make SWLV type and print their notes while table lamps are used for illumination of appropriate light to enable SWLV to read their work (Wong et al., 2016). Similarly, Eligi and Mwantimwa (2017) report that SWLV make use of different ICT resources in varied ways. For example, computers are used for multiple functions such as writing notes during teaching sessions, reading audiobooks and notes, listening to and other contents accessible in portable document format (pdf) and hypertext mathematics language (HTML). Others use alternatives to visual displays such as screen readers like JAWS and NVDA and window's eye programmes to access audio information; note-takers and tape recorders for recording and listening to notes while the internet is considered by SWLV as a vital resource due to its multifunction platform to access to online learning resources/materials in alternative formats that support their instruction. Likewise, Mathevula and Uwizeyimana (2014) recognize that ICT has benefits in teaching including enabling students to share learning resources, promoting collaborative learning as well as

autonomous search for information by SWLV for learning purposes even though many schools rarely use ICT as a pedagogical tool but mostly for administrative purposes.

On the other hand, Kavcic et al., (2017) observe that all students with visual impairment are excited to play games using computers with a designed perceive-conceive platform, which includes motivating and accessible elements of game-based learning. Similarly, Söderström & Ytterhus (2010) say that youths with visual impairment use ICT mainly for entertainment and leisure activities. They further explain that SWLV and visually impaired generally use ICT and enjoy opportunities with which the internet connected to the computer provides them including games that are taken as their hobbies. On the contrary, Wong Meng Ee and Libby Cohen (2010) observe that with skills and knowledge of teachers disconnected in ICT, how then can SWLV receive instruction including outside the classroom using ICT.

ICT plays an important role in compensating for the impairment and enhancing communication including access to information as the most significant value of ICT as well as increasing participation in learning (Edgar Pacheco et al., 2017; Erdem, 2017). They further note that SWLV can use PowerPoint projection, handheld electronic magnifiers, CCTV to access textual materials especially books; audio recorders to take notes; zoom text software to manipulate text fonts on the computer according to their needs which increase their reading pace; searching, retrieving and accessing the larger amount of information from different sources in a dynamic and timely manner. On the side of teachers, they observe that ICT enriches teaching in a way that they use it for downloading notes and providing access to learning materials online as well as using PowerPoint presentations in enlarged formats to enhance the teaching of SWLV.

Whereas the study above is relevant to this study, it focused on issues related to SWLV transitioning to higher education and did not focus on the Secondary Schools entirely of which

this study focused, the ICT as innovation must be embraced by teachers in an attempt to bridge the gap that is created by the low vision condition.

ICT could be used to make SWLV access public examinations as well as learning experiences including virtual experiences which are open to students without disabilities (Tokareva and Turner, 2011). They, therefore, argue that there is a need to make ICT resources available as early as possible in the education of students with disabilities including those with Low Vision and subsequently training done by teachers to enable them to develop necessary skills to use ICT during the teaching process.

Likewise, Douglas et al., (2011) observe that computer technology notably screen reading software, screen magnification software and Braille translation software has become universal in the education of SWLV. They explain that it provides access to information that would otherwise be difficult or even impossible for them to obtain. They further elaborate that ICT resources like a computer can enhance visual presentations such as colour contrast of screen display of large print/text or provide alternative presentations like speech out during teaching.

SWLV make use of ICT to take their notes directly on their Personal computers or request teachers to send them the course materials in format by emails or Digital Visual discs or memory cards (Carriere, 2012). This may enable students to access information before, during and or after the lessons thereby enhancing cooperation between the teachers and SWLV.

ICT as a pedagogical resource is used to get access to current and wider teaching resources from the databases for both teachers and SWLV anywhere at school and outside the school (McKnight et al., 2016; Kumar & Sanaman, 2013). They report that SWLV can record and present their work on an ICT device during and after teaching and search actively for their knowledge by

looking for answers online or internet at any time rather than passively waiting for answers from teachers. They further observe that teachers make use of ICT software like exam view and data director to track students' progress and assignment over time thus providing timely feedback to the SWLV. They also report that teachers make communication to SWLV via emails, texting and virtual classrooms, and using online platforms such as Facebook and WhatsApp to interact support and engage with peers in discussions which promotes learning as a partnership. Similarly, Majinge (2014) adds that ICT is utilized to facilitate access to information in accessible electronic databases and on the internet and that it provides equal opportunities to access information following the needs of SWLV just like their sighted peers.

Besides, Bouck, et al., (2011) point out that ICT offers SWLV opportunities to present their work and solving scientific calculations during the teaching process thereby reducing the time spent to complete work as well as fostering independence. This is an indication that SWVI including SWLV can do mathematics and physical sciences more independently with the use of adapted ICT resources at their disposal.

ICT has an important role in teaching (Tedla, 2012). Tedla, in particular, points out that teachers use ICT to organize content in their respective subjects and present it to students in an accessible format making it easy for them to understand; makes a classroom a playfield where both students and teachers can interact, communicate and collaborate during the time of instruction; keeps students interests and motivations intact and or high in the process of teaching as it makes teaching fun; teachers spend less time and increases the level of participation by SWLV.

On the contrary, Cryer et al., (2013) observe that many Science Technology Engineering and Mathematics (STEM) subjects heavily rely on visual resources such as graphs, diagrams and charts which are inaccessible to partially sighted students. They elaborate that it is difficult to

provide accessible resources to these symbolic subjects than other literary-based subjects. Cryer further argues that accessing aspects like equations via audio format, for example, is challenging because, by nature, it is linear. They further assert that with large/magnified print, it is difficult to access the whole equation at once. It was therefore concluded that it is difficult for SWLV not only to access key materials such as notes but also to carry out further reading around the subjects. Equally, Rule et al., (2011) assert that whereas STEM fields are important in today's world, they are underrepresented by students with disabilities with SWLV inclusive. They argue that although SWLV are cognitively similar to their sighted peers, they face challenges as STEM subjects are often taught using visual representations. This means that whereas ICT is very essential in teaching, it is yet to substantially break the barriers in these science areas.

Following the discussion from the literature, there is no doubt that ICT is now an integral part of the teaching process in the current trend and ICT resources can positively influence and or contribute to the teaching of SWLV in Secondary Schools. What is required is for the teachers to adapt and tailor ICT resources per the unique needs of each SWLV as low vision affects individuals at varying levels. Thus, ICT integration in the teaching of SWLV is something that should be embraced by all educators in an attempt to make accessible the general curriculum to SWLV.

The review has, however, identified gaps in the preceding discussions/review presented above such as; Some studies reviewed did not focus on using ICT to teach SWLV in Secondary Schools but also included other levels of education including primary and tertiary institutions. However, the current study attempted to address this gap by focusing on only Secondary Schools.

Most of the studies reviewed were conducted generally on AT for persons with visual impairment of which ICT is wider and thus not specific on ICT resources for SWLV as proposed by the current study. This study, therefore, came in handy to address this gap by precisely focusing on ICT resources for SWLV other than AT. Besides, those studies that dealt with ICT concentrated on all categories of SWVI including the blind and low vision. This study has overtly addressed the gap by focusing on ICT adapted for enabling SWLV to learn during instruction/teaching.

Throughout the literature review, it was discovered that there are little or almost no studies that have been carried out relating to how ICT resources are utilized as a pedagogical tool for SWLV let alone for SWVI in Uganda and this has created a significant gap in the delivery of education services to this group of students. This study addressed this by specifically focusing on how best ICT influences the teaching of SWLV in Secondary Schools in Uganda.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

This chapter presents the methodology which guided the study on ICT and its use in teaching SWLV in Secondary Schools in Mukono District, Uganda. It describes the research approach and design, area of the study, target population, sample and sampling procedure, research methods and instruments, data collection, data analysis, and ethical procedures that were put into consideration. It also presents the limitations and delimitations of the study.

3.2 Research approach

There are several approaches in carrying out research, including qualitative, quantitative and mixed research methods (Bryman, 2016). This study used a qualitative research approach in an attempt to explore the use of ICT in teaching SWLV in Secondary Schools. The qualitative research approach is defined as an inquiry that seeks to understand a given social phenomenon or research problem from the perspective of the local population involved (Farr, 2008). The qualitative research approach was ideal in this study because it enabled the researcher to obtain specific information, study and build a holistic picture, and detailed views from the participants in a natural setting. The natural setting, in this case, was a Secondary School where SWLV are studying from. This approach also uses smaller sample sizes and thus saved time and costs of carrying out the study.

3.3 Research Design

This study used the case study design in examining the influence of ICT in teaching SWLV in secondary schools. A case study is a qualitative approach method in which the researcher explores real-life, contemporary bounded system or multiple bounded systems over time through

detailed and in-depth data collection (Creswell, 2013). Creswell adds that a case study may be a concrete entity like a School, Organization, and an individual or less concrete one like a community. The case study design was preferred because it enabled the researcher to obtain information from real-life context/setting about the research problem under investigation. Besides case study helped to answer questions of "how" and "why", which were aimed at providing a space for participants to offer more extensive data concerning a phenomenon of interest and based on knowledge and experience of participants (Yazan, 2015). I, therefore, benefited from this research strategy because of the interest in studying a case/unit in detail and in-depth inquiry as I explored how ICT influences the teaching of SWLV. The "case" in this study was a Secondary School which houses a Unit for the Blind and Low vision students in Mukono district.

3.4 Area of study

The study was conducted in one Secondary School found in Nakisunga sub-county, Mukono district, central Uganda. This institution was chosen because it is one of the 20 government-aided regular Secondary Schools in Mukono district which hosts a Unit for blind and low vision students, whose essence in this study was very paramount. Its proximity to Kampala where the researcher studies from, made it also more convenient. Mukono district is bordered by Wakiso District in the west, Kayunga in the north, Buikwe in the east and Lake Victoria in the south.

3.5 Target population

The target population of this study was teachers and the SWLV. The target population is defined as the group of individuals or participants with specific attributes of interest and relevance to the research problem under investigation (Asiamah et al., 2017). The entire population for the study

was 44 of which 26 were teachers and 18 were SWLV in the school from which the sample was obtained.

The teachers were particularly identified as potential participants because they are directly involved in facilitating the teaching process while the SWLV are the beneficiaries of the use of ICT as a pedagogical tool in teaching.

3.6 Sample size

A sample is described as a group of people, objects or items that are taken from the larger population as a representative for measurement (Mujere, 2017). Mujere notes that this is done to ensure that the results from the sample can be used for generalizing over the entire population. For this particular study, therefore, the sample comprised 6 teachers engaged in day-to-day teaching and 6 SWLV, giving a total of 12 participants. This study was therefore cognizant of Creswell's (2014) argument of having a case study involving a limited number of participants so that the researcher can collect as much detailed information as possible from each participant.

Table 1: Sample of participants

S/N	Category	Number of participants
1	Teachers	06
2	SWLV	06
Total		**12**

3.7 Sampling technique

Sampling is the act, process, or technique of selecting a suitable sample, or a representative part of a population to determine the characteristics of the whole population (Mujere, 2017). To carry out this study, purposive sampling was used in selecting the teachers and SWLV as participants. Purposive sampling is a non-probability type of sampling, in which the selection of units

including people, organizations, documents, and items is based on the understanding of the research problem and phenomenon in the study (Creswell, 2013; Bryman, 2016). Creswell (2014) further elaborates that purposive sampling increases the usefulness of data to be collected from the participants. This sampling technique was also preferred because it also attempts to select participants on certain attributes or criteria (Mwakyeja, 2013).

The criteria used to select teachers were based on three assumptions. First, the teacher who teaches ICT to SWLV in the school was nominated since he is responsible to facilitate SWLV in learning ICT as a subject as well as how to use the available ICT resources in the ICT facility/resource room for pedagogical purposes. Secondly, the teacher who is in charge of the resource room where most of the ICT resources for teaching SWLV are kept. The fact that he interacts with SWLV most of the time as he attempts to support them, he was deemed to have useful information for the study, and; thirdly, other teachers who had got no specialized training in teaching SWLV but with experience in teaching SWLV including face to face interaction in the classroom settings for at least five years in the school were as well picked to become participants. This was based on their long-time experiences of teaching SWLV and therefore were assumed to have useful information for the study. For SWLV, level of severity (from less than 6/18 to perception of light) of low vision condition was used as criteria to select them. To do that, the researcher used the information from the individual SWLV records to ascertain the severity of low vision. Besides, gender sensitivity was observed. Thus, three of them had a severe low vision but with some usable sight while 3 had moderate low vision.

3.8 Methods of Data collection

There are many methods of collecting data in a qualitative research approach. These are interviews, document analysis, observation, archival records and artefacts and focus group discussions (Yin, 2014). Based on the nature of this study, interviews and observation were best suited in collecting data. These two methods were used to blend the data collected and also check on the accuracy of the information given.

3.8.1 Interviews

An interview is a conversation between partners (interviewer and interviewee) that aims at having in-depth information about a given topic or subject, through which the phenomenon could be interpreted in terms of the meanings from the interviewee (Alshenqeeti, 2014). There are three types of interviews used in collecting information in qualitative research (Bryman,2016; Alshenqeeti, 2014). The structured interview also is known as a standardized interview which entails the administration of already predetermined questions to all participants; semi-structured interview where the interviewer has a series of questions on the interview guide but has freedom or flexibility to vary or adjust the questions to suit the needs of the interviewee; and unstructured interview in which a list of topics or issues to be covered are provided but the questioning style is informal.

To obtain data in this study, a semi-structured interview was preferred to collect data about the nature of ICT resources, the teachers' preparedness in terms of training as well as information on the use of ICT in teaching from the teachers and the SWLV. The choice for this type of interview was premised on the freedom and flexibility to adjust questions accordingly, probe and expand the interviewee's responses during the data collection process (Bryman, 2016; Alshenqeeti,

2014). They further add that it enables the interviewee to elaborate on key issues to provide detailed information as may be deemed necessary to the study. The researcher sought rapport with the participants by presenting the request letter asking them to participate in the study and thereafter appointments were made for the interviews to take place.

3.8.2 Observation

Observation is an act of noting a phenomenon in a field setting through the five senses including sight, smell, hearing, touch and taste of the observer, often with an instrument and recording it for a scientific purpose (Creswell, 2013). Observation method was preferred because it enabled the researcher to obtain first-hand information from the natural setting of which the participants were not able to provide and verifying what the participants said as well as non-verbal expressions (Kawulich, 2014). The researcher made use of this method to obtain information on ICT equipment/resources and ICT facilities as a way of confirming the verbal responses that were obtained from the participants. Besides, the researcher also wanted to observe how the teachers and or SWLV use the ICT resources to facilitate the teaching process. This aspect was however not observed due to the closure of schools in Uganda due to the Coronavirus pandemic. Notwithstanding, the researcher went ahead to observe the ICT equipment/resources available in the school by seeking permission from the school administration to be allowed to access the resource room/ICT laboratory.

3.9 Pilot study

A pilot study is a small study conducted to help in pretesting and retesting the study procedures or methods, the validity of study tools as well as recruitment or estimation of the sample size (Arain, et al., 2010). A pilot study was therefore carried out in another Secondary School which has a similar learning environment of an annex for Blind and Low vision Students in eastern

Uganda. This was done to pre-test my data collection tools to detect any possible weaknesses in the questions. The results indicated that the school had inadequate ICT resources for SWLV and the teachers were not adequately trained in adapting ICT for teaching SWLV. An appropriate revision to questions in the tools was done accordingly to enable me to obtain valid and reliable data for the main study.

3.10 Data collection procedures

Before undertaking the actual study in the proposed area, approval of the research proposal by the supervisors as well as the Department of Special Needs Studies (SNS) Kyambogo University was sought. The researcher obtained permission to conduct the study from the Head of Department, in which an introductory letter was given. After obtaining permission, the researcher personally formulated a request letter addressed to the participants and thereafter visited the proposed study location to meet the prospective participants. The researcher then sought permission from the school administration to be allowed to meet and establish rapport with the prospective participants to present the expectations, seek informed consent and also get expectations of the participants. On agreement between the researcher and the participants, interviews were then arranged and conducted with each participant. During the interview, the conversation was audio-recorded and at the same time, there was note-taking by the researcher. Meanwhile, the researcher went ahead to also observe and ascertain the nature of ICT resources in the ICT facility/laboratory/resource room as a way of confirming the narratives from the participants

3.11 Data analysis

In its original form, raw data collected from the field do not give much meaning. Data analysis is thus, important as it is the way of describing and interpreting these raw data to obtain the

meaning and pattern from it (Mwakyeja, 2013). When the process of data collection was over, raw data were then transcribed from audio format into text format. The data transcribed from the semi-structured interview schedules and observation was checked and subjected to inductive thematic data analysis to build patterns, categories and themes. Qualitative data were transcribed, categorized through coding individually against themes derived from objectives/questions. Common themes were identified by searching for keywords or phrases and grouping them into categories and sub-categories. Thematic analysis is the process of identifying patterns or themes within qualitative data (Stranges et al., 2014). Bryman (2016) observes that when searching for themes, it is recommended that the researcher looks at re-occurring topics relevant to the research questions, categories of information which can be patterned, and similarities and differences in the discussion.

In reporting the information collected, some direct quotations from participants were used as recorded. Reporting direct verbal accounts from research participants is important because it upholds the taste of the original data (Mwakyeja, 2013). Also, the researcher's views/comments have been made on the responses from participants' answers given, backed up by literature reviewed in chapter two while codes have been used to protect the identity of participants where direct quotations from the participants are applied (Creswell, 2013).

3.12 Ethical Considerations

Ethical issues are part of the rigour of research and cannot be avoided and observing these ethics helps to protect the rights of the research participants, develop a sense of trustworthiness from them and promote the integrity of research.

For purposes of promoting credibility and authenticity, research ethical issues were observed at all stages of the research study with particular attention to consent and confidentiality of information for purposes of protecting the participants' image and privacy (Vanclay et al., 2013). In an attempt to keep these ethics, the participants were informed of the study purpose, duration, how the data collected was going to be used and a right to decline to participate in the study if they so wished. Informed consent from the participants was sought through a written communication requesting them to provide necessary information for the study including recording their views as a way to avoid violation of their rights in one way or the other. All participants voluntarily participated in this study and this ensured that they are aware of what was happening. Anonymity was observed by using codes during data analysis as a way of protecting the participants. The essence of anonymity in research is that information provided by participants should in no way reveal their identity (Vanclay et al., 2013). The ideas in this study have been presented in the researcher's own words, however; an appropriate acknowledgement has been made where ideas from other sources are used.

3.13 Credibility and or Authenticity

Credibility and authenticity refer to the virtues/dispositions or criteria for judging how true, believable, credible, dependable and or transferable the study findings are in the face of not only the researcher but participants and the readers of the study as well (Yilmaz, 2013).

To ensure the credibility and trustworthiness of the research findings, the following procedures were undertaken:

The instruments were designed, discussed and validated together with my supervisors; pretesting of the instruments through a pilot study was done under the guidance of the supervisors;

There was triangulation of data collection methods involving semi-structured interviews and observation, and data was collected from more than one group of participants as a way of ascertaining the authenticity of the information, and real narratives from the participants have been presented in the data analysis as a confirmation of what transpired in the field.

3.14 Limitations and Delimitations

In the process of carrying out this study, there were limitations as explained below:

One of the factors was the availability of participants of the study for data collection: Getting them to participate in the study was a little bit challenging because the period this activity took place was during the COVID-19 pandemic when the schools were closing and so, it affected some of the activities such as observation of the teaching sessions. Besides the prospective participants were scattered all over. This was, however, mitigated by following some of them to their destinations away from the school to have the interviews carried out.

This study was carried out in the central region and restricted to only one Secondary School which was selected due to its uniqueness of hosting a Unit/Annex for Blind and Low vision students, whose conditions may not necessarily be similar to other Secondary Schools all over the country. To demystify this fear, checks and balances were put in place to ensure the credibility and authenticity of the findings including carrying out a pilot study in another Secondary School with relatively similar conditions in another region of this country; use of triangulation in methods of data collection methods and participants as well as ensuring their privacy to ensure credible information was obtained.

Having tackled the methodology of how the study was conducted, the next section focuses on the

data presentation, analysis and discussion.

CHAPTER FOUR: PRESENTATION, INTERPRETATION AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter is a presentation and discussion of the findings of the study which sought to examine the use of ICT in teaching SWLV in Secondary Schools in Mukono District, Uganda. Data are presented in order of the research objectives which include: the nature of ICT resources that are used in teaching SWLV; teacher preparation in using ICT resources while teaching SWLV; and how ICT is utilized to facilitate the teaching of SWLV in Secondary Schools.

In presenting data, verbatim statements from the respondents are used to maintain the originality of the information collected. In each section, the presentation of the findings starts, then the discussion of these findings according to the literature reviewed in chapter two immediately follows. In the interest of upholding privacy and or anonymity, the codes SWLV and TR respectively have been developed and used to hide the identity of the participants and or to ensure confidentiality. The results have been presented and discussed according to the themes and sub-themes developed from the data collected and the literature review. The findings are also presented according to the views of the participants focusing on themes and sub-themes emerging from the data analysis.

4.2 Description of Participants

The study targeted teachers and SWLV in Secondary Schools. The total sample size of participants anticipated was 12 comprising 6 teachers and 6 SWLV respectively. From the above, all the participants were reached and interviewed. This was possible due to the small number selected. More details are shown in the table below.

Table 2: Demographic characteristics of Participants

Category	Gender		Total
	Male	Female	
Teachers	4	2	06
SWLV	3	3	06
Total	**07**	**05**	**12**

Source: Primary Data

Teachers

This study was interested in the teachers who had spent some time interacting with SWLV in both inside and outside classroom curricula activities. The individual characteristics are presented below:

TR1: She is female with a Master's degree in education and experience of 6 years teaching SWLV in this Secondary School. She teaches Christian Religious Education and Literature at both O'level and A'level.

TR2: He is male with Bachelor of Education (Science) with experience of 6 years teaching SWLV in this school. He teaches Mathematics and Physics at O'level.

TR3: He is a male with a Bachelor of Science in Education and experience of 8 years teaching SWLV. He teaches Mathematics and Physics at O'level.

TR4: He is a male and holder of Bachelor of Arts with Education and has taught SWLV for 6 years in this Secondary School. He teaches History at both O'level and A'level.

TR5: He is male and holds a Bachelor's Degree in Arts with Education and has working experience of 22 years with SWLV. He teaches History and ICT at A'level and O'level respectively.

TR6: She is female with a Diploma in Education and with a working experience of 6 years with SWLV. She teaches Christian Religious Education and History at O'level.

Students with Low Vision

The study was interested in SWLV with severe to moderate low vision condition to share their experience in using ICT during instruction. These students were selected across O'level and A'level.

4.3 Nature of ICT resources used in teaching SWLV in Secondary Schools

The study sought to establish the nature of ICT resources that are used in teaching SWLV in Secondary Schools. This aspect was important because the nature of ICT resources determines how they influence the teaching process. The emerging issues were low-tech, high-tech ICT resources and the state of the ICT facility:

4.3.1 Low-tech ICT resources

When participants were asked about the low-tech ICT resources made available for teaching SWLV at school, participants (n=12) responded that the school has a few talking calculators which are used by SWLV. One of the participants had this to say:

> The low tech-ICT devices I have seen and used in my school are talking calculators which we use including examinations by connecting to the headsets with a microphone so that they do not make noise but also to hear what the teacher is saying without removing (SWLV 4).

Another participant had this to say:

> By the way, as a school, we are not very rich in those items (ICT resources) but we have like the talking calculators though not many of them are there (TR 2).

From the above statements, talking calculators are indeed part of the low-tech electronic ICT resources that offer an opportunity for SWLV to engage in activities during the teaching. There is also an indication that they are comfortable to use by SWLV. However, there is an impression that these are the only low-tech devices available for the SWLV out of a pool of others available on the market and yet not adequate for all SWLV.

However, it also emerged from the data that some of the SWLV come with simple phones on their own and make use of them to record work on memory cards for onward use. This is evidenced in the response below: *"Oh! The low-tech ICT resources they have access to are talking calculators and of course, some of them use simple phones to record and read their work"* (TR 4).

The finding and statement above suggest that SWLV have improvised to use their non-android mobile telephones to have access to the content being taught by teachers. Simple telephones are easy to manipulate and therefore become handy in recording audio information during the teaching in circumstances that the school does not have adequate and variety of low-tech electronic ICT resources for SWLV to choose from.

When an onsite observation was made while in the school, the researcher found out that the ICT facility had only talking calculators which were not also many, which information corresponds with the narratives of the participants given above.

What is worrying, in this case, is that there are only talking calculators provided by the school and SWLV have to improvise access to information using simple mobile phones to record and access information. This suggests that little effort has been made in making low-tech ICT resources available and yet low-tech ICT resources are less costly, handy, easy to manipulate and

use by both SWLV and teachers. Therefore, schools should be encouraged to procure or lobby for more and make them available in the school for the benefit of SWLV.

The results above indicate that whereas there are varieties of low-tech ICT resources which teachers and SWLV could have access to and use in the teaching process, the school has only talking calculators. Though talking calculators are relevant to science-related subjects, SWLV in most cases end up undertaking arts-related subjects and perhaps find it challenging to access information in these subjects. Relatedly, Sah (2015) explains that low-tech ICT resources are electronic devices that do not include sophisticated and complex components such as electronic voice recorders, audio players, talking calculators with large keys/prints and electronic magnifiers. Additionally, Shikden (2015) observes that talking calculators and clocks as well as computers were the only ICT resources available in schools and concludes that ICT resources were mainly low-technology devices.

4.3.2 High-tech ICT resources

From the expressions of the participants, it was stated that the school has some high-tech ICT resources which include, computers, CCTVs, clear reader, printer, victor reader, and Braille embosser. They also mentioned that the school has a PowerPoint projector but only accessible when the headteacher is available. One of the participants responded that:

> We have a victor reader, a clear reader for scanning and reading printed text. We also some computers installed with JAWS for them to use, CCTVs for reading large print, a printer for printing large print and for brailling the work, we use an embosser (TR 5).

In a similar response, another participant stated:

For the high-tech, we have a victor reader which is used for recording and they are easy to use because any button you press reads what is there and it is clearer than the ordinary audio recorders. They can also be connected to the computer and then turns a word document into audio. We have laptops so far with JAWS and are the ones we use for studying computer. We also have CCTVs which are used by SWLV to enlarge word documents for easy reading. There is a clear reader which scans what is in print format and reads though does not read handwritten documents. We also have Braille embosser and a printer which are only used by teachers as per now for embossing our work and printing large print (SWLV 4).

The narratives above reveal that teachers and SWLV have access to some of the current and sophisticated high-tech ICT resources. Devices like a computer installed with JAWS, a clear reader, victor reader are very useful to SWLV whose vision is so much deteriorated to use it to read and write print while a CCTV and printer offer those whose sight is still good to access large print. The findings also suggest that SWLV do not have to rely on predominantly Braille as it was before and this stands to mitigate the barriers during the teaching including that associated with access to information.

On the other hand, when the researcher made onsite observations from the ICT facilities to ascertain the high-tech ICT resources, it was discovered that there are some computer laptops installed with Job Access with Sound (JAWS) screen reader, a clear reader, a victor reader, a printer, an embosser, and CCTVs. I did not see the projector but participants revealed that it is kept by the headteacher in his office. This information is correlated with the above statements from the participants.

These findings suggest that the high-tech ICT resources available in the school for teaching SWLV include computers, CCTVs, a clear reader, victor reader, printer and an embosser. There is an indication that an effort has been made towards using them for instructional purposes,

something that must be commended and encouraged. However, there need to procure more of the high-tech resources to ensure that every SWLV has what to use during teaching.

Similarly, Erdem (2017) notes that high-tech ICT resources include computers and associated adapted software, CCTVs, clear readers, PowerPoint projectors, smartphones, mobile telephone software like Google assistant, the loop, zoom text, and Optical Character Recognition software (OCR) among others. Also, Sah (2015) describes high-tech resources as ICT devices that use complex, multifunction technology and usually include computer and associated software. Sah further identifies screen readers which convert electronic text into speech; screen magnifiers (zoom text) for presenting enlarged screen content; screen recognition software which allows input of data using a voice other than mouse/keyboard, OCR software, large monitors for enlarged view screens; large print keyboards with contrast colours (alternative keyboards); scanners for converting images from print material to computer file which can be converted into other accessible formats; and CCTVs as high-tech ICT resources compatible with SWLV

Whereas there is a similarity in the examples of high-tech ICT resources, what is existing in this Secondary School is just a minimum as compared to the variety of High-tech ICT resources highlighted by the above studies. This indicates that the level of interaction of SWLV or teachers with the ICT resources is limited in one way or the other since they do not have a variety of high-tech ICT resources to choose from during teaching. This stems from the fact that SWLV are affected by low vision condition differently and so require different ICT resources to access information for instruction purposes. Therefore, there is a need to have a variety of these high-tech ICT resources availed to schools to provide a higher advantage to SWLV to equally participate in the teaching process than the current situation

4.3.3 Condition of the ICT facility

Participants were asked to describe the situation in which the ICT facility is. Their expression was that the ICT facilities they have are not having all the ICT resources to a level comparable to the number of SWLV in the school to facilitate effectively the teaching process. One of the participants had this to say:

> For so long we didn't have a Resource room (one of the ICT facilities) and it is of recent that it was started but I realized that when you consider the number of SWLV and the blind, the computers they have are not enough. Actually, it is inadequately stocked up (TR 4).

Another participant responded that:

> The ICT facility is not well equipped because ICT resources are few and you find that students do not have enough time to practice and learn using them, and some SWLV even end up not touching the equipment in a day (TR 5).

Additionally, this participant had this to say:

> I would just say we have some of the equipment but not many. I can say they are inadequate in number because like we have only one clear reader and over 25 Visually impaired students. So, we cannot access it (SWLV 2).

The findings shown above provide an impression that the use of ICT as a pedagogical tool is a recent development indicating that it is just in the initial stages in the school. The results also suggest that SWLV do not have adequate time to practice and or utilize ICT resources on an individual basis. This is attributed to the fact that there are inadequate ICT resources provided for both teachers and SWLV to use during the teaching process.

The finding from observation of the Resource Room and the computer laboratory did confirm the narratives of the participants because there were only 3 laptop computers with screen readers (JAWS), 1 clear reader, 1 victor reader, 2 CCTVs, 1 printer, 1 Braille embosser and 4 talking

calculators in the Resource room while the computer laboratory has 30 desktops but with only 3 having JAWS.

Although ICT has been identified as one of the important remedies towards mitigating challenges SWLV face in accessing information during teaching, the above findings indicate that SWLV and teachers in this school are not efficiently using ICT to facilitate the teaching process, a situation which perhaps compromises on the quality of teaching and consequently SWLV learning. This could be attributed to factors like inadequate finances given to the school and lack of commitment from the administration of the school. According to the HAAT model, it is very categorical on AT which in this case are electronic low-tech ICT and high-tech resources and are taken as external enablers for which a person with an impairment (SWLV) uses to engage in an activity. This requires that the ICT facilities ought to be well equipped so that SWLV and or the teachers, in this case, have a choice to select from, what is appropriate for a particular activity during the teaching process as it has a bearing on teaching of SWLV and consequently determines the learning outcomes. However, this is not possible given the situation described in the above findings and therefore making it contradictory to the HAAT model. Thus, with only talking calculators, and a handful of high-tech ICT resources, their engagement in the teaching process is restricted in one way or the other.

Similarly, Mathevula et al., (2014) indicate that schools had scarce ICT resources for integration during teaching, with only television sets, photocopiers and computers available. It was further indicated that projectors were rarely used by teachers. The above prevailing situation in Secondary Schools illustrates that teachers and SWLV are not having access to adequate and appropriate ICT resources as an AT to support the process of teaching due to inadequacy hence reducing their level of participation during instruction.

4.4 Preparation of teachers in using ICT to teach SWLV

This objective sought to examine how prepared the teachers were to adapt and use ICT resources for facilitating the teaching of SWLV in Secondary Schools. This aspect is very crucial because knowledge and skills enable teachers to manipulate and operate ICT resources as well as support SWLV to use the same during teaching. The issues that emerged were general ICT training, specific training in adapting ICT and the ability to use ICT as a pedagogical tool to teach SWLV as well as challenges experienced by teachers and SWLV in using ICT. They have been analysed and presented as below:

4.4.1 General ICT training

The participants were asked to state the kind of general training in ICT and participants (n=6) stated that they did not have any formal ICT training. However, they revealed that the little knowledge and skills obtained were gained through informal arrangements such as interactions with colleagues, friends, workshops and with SWVI who are literate in ICT as well as personal initiatives. One of the participants expressed:

> Uuh! I have some informal training in ICT which I got from the induction of secondary school teachers for the new curriculum but it was just basic. I have not got any formal training in ICT throughout my life as a teacher (TR 4).

Another one retaliated:

> The training I have is informal and I was trained by my friend who was working with one of the Organizations for the blind on personal grounds and after getting the basics, the rest I have been trying on my own. Like I said earlier, I was just trained by a friend and my practice. So, I don't have any formal training in using ICT to teach (TR 5).

Whereas having general knowledge and skills in ICT gained from friends, workshops and colleagues is generally an added leverage towards operating a telephone and basic computer packages on a day-to-day basis, it is not adequate to prepare and guarantee the use of ICT in

teaching SWLV. The training got from colleagues and workshops and subsequently on their initiative, looks to have been generic in ICT and may have not prepared teachers to pedagogically use it to support the teaching of SWLV in the school.

This is contrary to the HAAT model that advances that human control several intrinsic factors including sensors, central processing and effectors as well as the skills and abilities which in turn produce an outcome. A teacher, in this case, is supposed to possess knowledge and skills to manipulate ICT resources at his/her disposal to deliver content or support SWLV by training them to manipulate the same devices to access the content being delivered during the teaching process. The finding is also in line with Şimşek, et al., (2010) who observes that most of the teachers (trainers) who were teaching SWLV in using ICT as AT had only attended a course on how to teach SWVI but the training did not sufficiently prepare them for teaching SWLV using ICT as an AT in form of a pedagogical tool and therefore observe that teacher preparation programmes ought to include arrangements for ICT training as a capacity-building strategy. Equally, Mathevula et al., (2014) note that the majority of teachers did not have professional qualifications in ICT and those who had training was too basic, which had an impact on their abilities and confidence to use ICT in the instructional process of all students including SWLV. They further observe that ICT requires the emergence of new skills, attitudes and pedagogical approaches through continuous training programmes to build adequate capacity among teachers. Similarly, Tedla (2012) says that teachers are not skilled in ICT usage as most participants revealed that they had never taken any training on ICT. Tedla further points out that ICT usage is highly dependent on teacher's characteristics including ability/competence and confidence and thus, teachers require ICT training at both pre-service and in-service levels.

From the discussion above, it is evident that having general informal training in ICT does not fully empower teachers with the knowledge and skills required to utilize ICT as a pedagogical tool for SWLV in Secondary Schools. This means that most of the teachers are not knowledgeable in using ICT resources to teach SWLV since none of them has formal training, something that deprives SWLV during the teaching process to have equal access to curricula activities.

4.4.2 Specific training in integrating ICT in teaching

When the question was asked whether the teachers had any specific training in preparation to adapt ICT for teaching, participants (n=4) mentioned that they did not possess any specific preparatory training in adapting and or integrating ICT as a pedagogical tool to teach SWLV. This is evidenced in the statements below: *"As far as the use of the ICT devices is concerned, I don't possess any specific training to adapt ICT to teach SWLV in my subjects"* (TR 3). Another participant had this to say:

> When I went to the Resource room, one of the teachers took me through what goes on there and I was so impressed with what is possible with SWLV and teachers and within me, I am only hopeful that we are all going to be trained in these ICT devices. Therefore, I do not have any specific training in ICT for the visually impaired and I am looking forward and hope that there will be any form of training so that we all engage these Students (TR 1).

The above findings and verbal statements show that teachers have not had an opportunity to have specific training in manipulating ICT resources for pedagogical purposes for SWLV though some are willing and or anticipating having such training to be adequately prepared to integrate ICT in their teaching process. The statements also suggest that there is little that such teachers can do about teaching or supporting SWLV using ICT resources in the school.

In a related account, Ramos and de Andrade (2016) indicate that teachers had confidence in ICT capabilities but were found with less resourcefulness in some of the ICT tools and software specific to the area of visual impairment including low vision, with a substantial number of teachers ignoring to use many of these. They further report that the lack of specific training is considered to be the main impediment for teachers regarding the full integration of ICT in teaching their SWLV. Similarly, Bingimlas (2009) says that teachers have a strong desire to integrate ICT into their teaching of SWLV but are encountered by barriers including lack of confidence and capability. Bingimals adds that access to ICT resources might be available but teachers cannot use them in the classroom to support teaching SWLV because it is difficult for them to operate ICT resources as well as enable SWLV to use them. Thus, recommended that providing effective pedagogical training for teachers rather than preparing them to use ICT tools is an important parameter in enabling its integration in teaching SWLV.

This implies that specific pedagogical training to prepare teachers in adapting ICT resources is paramount. It is also a prerequisite towards enabling teachers to integrate and utilize their general knowledge and skills in ICT to facilitate instruction of SWLV in Secondary Schools. Therefore, teachers ought to receive specialized training in adaptive ICT regarding attaining specific knowledge and skills to make them more resourceful in using ICT as a tool for teaching.

On the other hand, some participants (n=2) had a differing view as regards specific ICT training. They expressed that they had some specific training on using ICT resources to enable SWLV to learn during the teaching process. They revealed that they have been getting that training from friends and workshops as well as SWVI. One of the participants said:

The training we get from All we see is possibility programme' workshops managed by KYU have helped me to learn how to operate most of the assistive devices for these students with low vision (TR 5).

Another one expressed that:

Well, I have some little specific training in adapting ICT devices including reading and writing braille and its associated software. Additionally, my interaction with SWVI has also increased my skills in using the available ICT devices. Otherwise, I have not been sent for any specific formal training on adapting ICT for SWLV (TR 2).

The narratives given above suggest that even with the little informal training attended through workshops organized specifically to prepare secondary teachers to teach SWLV including operating ICT devices as well as interaction with some of the SWLV who enrol at school with a background in ICT, some teachers have gained some knowledge and skills in specifically manipulating the ICT resources at their disposal to facilitate teaching. This shows that these opportunities teachers have been exposed to in terms of learning how to operate ICT devices supplied in the school for SWLV have been helpful to them and improved on their capabilities or competence to utilize ICT for pedagogical purposes.

This finding is in agreement with the HAAT model argument which asserts that a human being expected to use the AT should possess knowledge and abilities to be able to control and use it in an activity. This also supports the finding of Siu et al., (2014) who says that most teachers had good proficiency in using ICT as an AT for instruction but also reveal that the proficiency of teachers in applying ICT is determined by their level of pre-service as well as continuous ICT training and recommends increasing pre-service training.

The skills of these few individual teachers have enabled them to support SWLV by training them to use the available ICT resources in the school Resource Room (ICT facility) to engage in instructional activities. However, in this era of technology advancement, it is not sufficient to

have a handful of teachers in a school skilled in adaptation and integrating ICT in teaching instead the entire staff ought to be prepared for the same by the school using an in-service mode of training

4.4.3 Ability to use ICT to teach SWLV

In this aspect, the study aimed at ascertaining the ability of teachers in using ICT resources to support SWLV during teaching. From the expressions, participants (n=4) mentioned that they are just at a basic level in using ICT as a teaching tool for SWLV. One participant responded that:

"To speak the truth, as far as using ICT is concerned, I am just at a learning/initial level because I have not even used any of these devices to teach my students" (TR 3).

Another participant said:

> If I may describe myself in using ICT, I would say I am just at the beginning like at 20% because I am just starting to learn more (TR 6).

Subsequently, this participant stated that:

> To be sincere apart from one teacher in the Resource Room (ICT facility) they use less ICT because the majority of the teachers do not have skills in using ICT. Even the resource room teacher uses ICT just because of being visually impaired but does not have any qualification (SWLV 1).

The statements above give an impression that most teachers are novices as far as manipulating ICT to teach SWLV is concerned in Secondary Schools and this means that they cannot do much when it comes to using ICT resources as a pedagogical tool to facilitate and or support the SWLV during teaching. The little knowledge and skills they have are generally basic and cannot support them to adequately use ICT resources for teaching SWLV.

The findings presented above also correspond to Shikden (2015) notes that only 0.07% of the teachers were experts in using ICT resources (devices) while a higher number of teachers either had no experience or were at the level of a beginner or novice in using ICT as an AT to teach SWLV, indicating that most of the teachers were not proficient in teaching SWLV using ICT resources. It is most likely that the lack of adequate formal training could be one of the factors facilitating this state of affairs.

However, some of the participants (n=2) had a differing response. Their expression was that they are proficient in using all ICT resources available in the ICT facility at school to support the teaching of SWLV. They said that the workshops that they had attended and their interaction with friends have enabled them to do so. One of them responded: *"With all these gadgets which are available in this resource room, at least I can operate or work with them without any problem"* (TR 2). Another participant supported by saying:

> The only teachers for me and my friends have got help from are the two in the Resource room. Other teachers teach us but do not use ICT though sometimes you may find some of them in the staff room with some of the devices like laptops (SWLV 6).

These findings suggest that teachers who are directly working with SWLV in the resource room (ICT facility) have mastered how to use the ICT gadgets available to support their SWLV to learn. This is due to the continuous experiences or practice with the ICT resources available and interaction with SWLV as well as training and induction given to them during workshops organized outside the school on supporting SWLV to learn in Secondary Schools.

Likewise, Tokareva and Turner (2011) emphasize that digital capability/ability is one of the key competencies in the new skills especially in the use of ICT equipment and digital content as well

as tools in teaching and that the purpose is to enhance the digital skills and literacy for improving accessibility by SWLV and other PWDs.

Their ability to operate ICT resources to support SWLV in their quest to learn is encouraging though it has been informal. This is something that should be promoted or extended to other teachers to fully move towards the integration of ICT as a pedagogical tool for SWLV.

4.4.4 Challenges in using ICT resources

As a follow up on the above, a question was asked to find out the challenges that teachers and SWLV face in an attempt to use ICT in teaching. Several issues emerged and have been analysed and presented as below:

From the expressions of the participants (n=8), it was also revealed that teachers do not have adequate training in using ICT resources for teaching purposes. This in itself becomes a prohibitive factor for utilizing ICT to teach SWLV in secondary schools. One participant said:

> The biggest problem, of course, is that I have not had any formal training because when you look at teaching the Visually impaired students, it is a bit technical and one must have specific training and of course as a teacher, there is no way you are going to teach something if you have not had training (TR 3).

Another participant responded:

> The challenges I face is that because some teachers don't know how to use ICT equipment and there are subjects like general science, we find ourselves studying what we are not supposed to study. We study with other ordinary students and teachers just write on the chalkboard and we get nothing just because they do not know well how to use ICT devices (SWLV 4).

This participant had this to say: *"The challenge we experience with the use of ICT to teaching us is lack of a professional ICT teacher to help in training us in ICT skills"* (SWLV 1).

The statements indicate that although teachers admitted to having had informal training in ICT, it has not prepared them to gain sufficient skills for most of them to be able to make use of ICT to support SWLV during the instructional process. It is also true that a teacher cannot appropriately teach SWLV using ICT because it is technical and at least requires specialized training for one to do so. The findings also reveal that due to the lack of adequate training in ICT, ordinary teachers find it difficult to enable SWLV to access information in appropriate formats during teaching. This is something that deprives SWLV of quality learning which subsequently has a negative impact on their learning outcomes.

Similarly, Msila (2015) points out that many participants felt inadequate in applying ICT and without proper training, any attempt to utilize ICT in teaching can embarrass and expose their inadequacies in the classroom before students. Msila further elaborates that ICT competence is highly linked to training including continuous professional development and attitudes, as pertinent ingredients towards the success of its instruction usage and thus concludes that any innovation in education including ICT needs competent teachers.

Certainly, adequate training has been highlighted as one big factor in enabling teachers to attain requisite knowledge and skills to gain confidence and competence to ably deliver curricula activities to SWLV using ICT resources in Secondary Schools. It is obvious that without this, their efforts to teach SWLV is greatly inhibited.

Another emerging issue that came up during the interaction with the participants was that some of the ICT resources are not easily accessible to teachers and SWLV for instructional purposes. It was stated that some of them are not adapted to the needs of SWLV, or they are few or are restricted in terms of access and therefore some end up having no access while others are not

readily available for use by both teachers and SWLV. The following responses affirm to this finding:

> The major challenge I can say is accessibility because you may want to teach using ICT but the gadgets may not be accessible completely especially those in the computer laboratory, and because of that the SWLV cannot use computers. Besides, those ICT devices in the Resource room are few compared to the number of SWVI we have and so, like CCTV has to be used by one SWLV but you have to make a class share (TR 2).

> Aha! With the internet, it is only the headmaster who has wifi in his office and when he is not there, there is no one else who has access to it. I can say he moves with it in his pocket (TR 4).

The above statements indicate that whereas the school has some of the appropriate modern ICT resources like the Internet, teachers and SWLV are restricted to have access to them or are not available for use when urgently required to facilitate teaching. The findings also suggest that some of the resources are not adapted to suit the needs of SWLV, which means that they cannot be utilized by teachers and SWLV to support the teaching process. This is detrimental towards a right to access to information for instructional purposes

There was another main issue that came upon the availability of resources. Participants (n=7) did point out that there are inadequate ICT resources in the school, something that inhibits them from fully making use of ICT during instruction. One participant mentioned that:

> Another challenge is the lack of enough equipment. The Resource room (ICT facility) has only 3 laptops and one is used on the braille embosser and it is hard for us to access them for learning purposes (SWLV 1).

Another participant expressed that:

> The biggest challenge is that because they are inadequate, you may be wanting to use one of them (ICT devices) but when it is already occupied and we are of different classes (SWLV 2).

These findings suggest that whereas teachers are not properly equipped with knowledge and skills, the situation is complicated with a lack of ICT resources in sufficient quantities. There is also an indication that it is a little bit difficult to access ICT resources for use in the teaching process by SWLV and teachers and those who get a chance to access them may not be allowed to maximumly use them since they may be given little time.

The above findings concur with Yusuf et al., (2012) who reveal that majority of the institutions did not have the required ICT equipment for students with disabilities including SWLV. Similarly, Andoh (2012) observes that access to ICT infrastructure and resources in schools is a necessary condition for ICT integration in education. Andoh further explains that the adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware and software and that if teachers cannot have access to ICT resources, then they will not use them.

This indicates that ICT resources that are most likely to facilitate teaching are either not available for them to use or not accessible thus, not all SWLV and teachers can get access to ICT resources to facilitate learning during the teaching process. Having adequate and appropriate ICT resources in schools and making them readily available to teachers and SWLV are definite prerequisites to positively influence the teaching process in secondary schools.

From the data, participants (n=3) reported that lack of reliable electricity supply in the school possesses a challenge towards the use of ICT resources as a pedagogical tool for SWLV. The following verbal statements confirm this finding:

There is also a problem of electricity and sometimes when it is your turn to learn and power has gone, you have to wait for the next time when you get another turn and that means you miss (SWLV 6)

The problem of electricity is there as it is not reliable because any time it goes off and since we are in a rural area, we don't have a standby generator and our solar is not strong enough to run this equipment (TR 5).

This finding presented above suggests that the use of ICT resources to teach SWLV has been greatly disrupted by the inconsistent power supply. Most of the ICT resources indeed require a substantial amount of electric energy which must also be consistent in its supply. However, in this case, the school does not have a stable power supply and this makes it hard to operate ICT devices like computers, clear readers, CCTVs and printers that are available in the school.

The findings are in line with Adomi and Kpangban (2010) indicate that power interruptions were ranked among the causes of the low level of ICT use in schools and explain that electricity failure was a persistent problem against the use of ICT. Most of the ICT resources if not all especially the high-tech such as computers, CCTVs, printers and printers are heavily dependent on timely and or consistent electricity supply and therefore, any shortage disrupts their utilization for pedagogical purposes. In support of the above, Bandung et al., (2016) observe that the availability of electrical resources is one of the important factors related to electronics; thus sufficient power source is required so that a lesson where ICT is being used can be conducted. They further point out that it is a requirement to have an alternative to electricity including using the uninterrupted power supply (UPS) system. In light of the above, there is a need therefore for the school and other stakeholders in the school to rethink and put in place mechanisms to solve this challenge towards the utilization of ICT for teaching purposes for SWLV.

From the data, participants (n=2) mentioned that negative attitudes from the stakeholders in the school towards the use of ICT in teaching SWLV have contributed to its low level of use by teachers and SWLV for instructional purposes. They stressed that it has affected the interest in utilizing this facility to benefit the SWLV during teaching. One participant responded: *"The other challenge is administrative because the machines are highly guarded and certainty of accessing the ICT facility is restrictive"* (TR 1).

One other participant said:

> Generally, the attitude of SWVI whereby some of them have a negative attitude towards ICT. They believe that maybe, they cannot do much with their disability and so you have to keep on convincing them that you can (TR 5).

The above indicates that whereas the use of ICT in teaching SWLV is inevitable in secondary schools, negative attitude from those who are in charge and the users may make it difficult to utilize this resource for the benefit of SWLV. This kind of attitude could be attributed to a lack of appropriate awareness about the SWLV and how best they learn. Restricting teachers to use ICT resources denies SWLV an opportunity to have a levelled ground with their sighted classmates towards access to the curriculum.

This concurs with Andoh (2012) who acknowledges that numerous factors influence teachers' use of ICT. Andoh illustrates that teachers' knowledge and attitudes influence their use of ICT in teaching because their attitudes towards technology determine their acceptance of the usefulness of technology and its integration into teaching. If attitudes are positive towards the use of technology, then they can easily provide useful insight into the adoption and integration of ICT into teaching processes.

For any innovation in education therefore to succeed, the providers including the administrators and users (teachers and SWLV) should willingly accept it and integrate it into their plans and programmes in the school.

4.4.5 Suggestions to overcome the challenges

When the participants were asked how the challenges identified above can be mitigated, many ideas came up including providing in-service teacher training in ICT, equipping ICT facilities with more equipment, improvising ICT resources and collaboration with other schools. They have been analysed and presented as below:

The participants (n=8) stated that teachers in Secondary Schools urgently need in-service training in ICT integration in teaching SWLV. One participant expressed that:

> I request the Department of Special Needs Education in Kyambogo University in collaboration with MoES may be to organize an in-service training since in our training as teachers we were trained in teaching the other normal students (TR 4).

Another participant said, *"To me, I think the teachers should undergo training to learn how to use those ICT devices"* (SWLV 3).

The findings indicate that teachers in Secondary Schools should be given opportunities to undergo training in ICT either through in-service channels such as internal and external workshops/seminars or at a preservice level while they are still in the formative stages of the teaching profession. However, on a short-term basis, the focus should be put on in-service training to prepare teachers in integrating ICT in their teaching as a means of increasing learning opportunities for SWLV in secondary schools.

This is in line with Tokareva and Turner (2011) who point out that dedicated staff development and training in ICT to ensure that they have the necessary knowledge in the use of ICT for

pedagogical purposes as a means of addressing the unique needs of SWLV is a prerequisite. Similarly, Bandung et al., (2016) also emphasize that teacher development is a key factor in the successful integration of ICT in teaching. They explained that whether a beginner or experienced, ICT training programmes develop teachers' competencies in its use, influence their attitudes towards its use and assists teachers to re-organise the task of technology and how new technology tools are significant in SWLV's learning. Besides, Wong et al., (2016) observe that the professional development of teachers in ICT for the entire school teaching staff is very critical. The teacher preparation should be dedicated to not only developing ICT skills in teachers generally but enable them to pedagogically learn how to adapt ICT resources and use them to benefit SWLV during teaching in secondary schools.

From the data, participants (n=4) expressed the need for stocking ICT facilities with more equipment necessary to support teaching SWLV in Secondary Schools. They explained that currently, the ICT facilities are having a few ICT resources compared to the number of SWLV. One of the participants stated:

> Since my school is a government school, the MoES should make it a priority and if they want to give say computers to schools, they should start with schools that have special needs children like ours (SWLV 6).

Another Participant added:

> The ICT resources themselves should be made enough in large numbers so that SWLV can practice in their free time and the teachers may be can assist us whenever we get difficulties (SWLV 4).

Considering these expressions, there is an indication that secondary schools are in urgent need of well-equipped ICT facilities, especially for SWLV. The findings also show that there is an urgent need for MoES to prioritize equipping ICT resources to secondary schools with SWLV because

these students are at a high disadvantage compared to their ordinary colleagues in terms of accessing curriculum activities during teaching. The ICT resources have to be appropriate and or accessible to give ample time for SWLV to practice and make use of them for instructional purposes whenever they are in class.

This suggestion corresponds with Oira (2016) who recommends that schools should be equipped with modern AT which are less bulky, easier, quick and motivating as it encourages independence in learning. Stocking of ICT facilities in Secondary Schools with appropriate equipment to act as AT to SWLV has two benefits. First, it will enable the SWLV to have access to ICT resources and time to practice; and secondly, to do their work timely whenever they are given assignments or exercises.

The participants (n=2) were of the view that teachers should learn to improvise ICT resources to teach SWLV in case the real ICT device is not available. They said that for example instead of waiting for a school to acquire an audio recorder, SWLV can be encouraged to use simple phones with memory cards to record lessons of store notes. The verbal extract from one of the participants is presented below:

> Improvising the little ICT resources, we have for example because victor readers are not enough, we save work on memory cards so that each one of them accesses information using their simple phones (TR 5).

This finding suggests that some of the ICT resources can have alternatives and so, teachers should be encouraged to improvise so that SWLV can still have access to information during teaching. However, this calls for the training of teachers and or SWLV to be able to do so. Devices like memory cards are cost-effective and teachers can encourage SWLV to obtain one so that they can serve a similar purpose as other sophisticated ICT devices.

In agreement with the above, Aina (2013) indicates that improvised materials/devices aid the teacher in his/her teaching and students stand to gain more as they participate in the process. Aina therefore, concludes that improvised materials/devices had a positive influence on students' learning. It was further recommended that in this ICT age, teachers ought to be able to utilize local materials to adapt and produce learning materials in schools but cautioned that students ought to be involved to expose them to creativity, innovation and curiosity.

Although the above study was not directly involving SWLV, it relates well with the suggestion proposed by the teachers. This implies that in the absence of appropriate ICT resources, teachers ought to adapt other available electronic devices to provide alternatives for SWLV to have access to information during the process of teaching. This should include training the SWLV to adapt electronic ICT devices such as memory cards inserted in simple phones for recording lessons and other relevant instructional activities.

The data also shows that some participants suggested that the school or teachers can collaborate with other schools who have similar students so that they can borrow good practices as far as using ICT resources as a pedagogical tool is concerned. This is evidenced in the verbal extract from the participants below: "Also, we have to contact our colleagues in other schools with similar students to borrow ICT equipment or benchmark what they do to help SWLV in their schools" (TR 5).

This finding indicates that if a school does not have certain ICT equipment, it is possible to obtain such a tool from a sister school. It is true that when teachers collaborate with their colleagues in other schools that enrol SWLV, they learn from one another, borrow/exchange

ideas on how to adapt ICT resources for integration into their teaching, or even ICT resources to support their SWLV during a teaching process in their respective school.

Similarly, Argyropoulos et al., (2014) argue that the teachers' success in bridging the gap between usage of specialized ICT devices in specific educational settings and classroom was partly due to collaborative computer game training. Also, Jo Shan Fu et al., (2013) suggest that supporting partnerships among teachers that help teachers share ICT practices and experiences is a way of making them prepared to manage technology-rich teaching.

This was because collaboration provided a fertile ground for consolidation of their knowledge in AT. It is further elaborated that teachers realized that they have to learn how to use specialized software and hardware to teach their SWVI including those with low vision through a variety of media.

The teachers should thus be provided with opportunities by administrators that enhance collaborative practice between schools as a way of expanding training opportunities for the teachers in Secondary Schools.

4.5 Use of ICT resources in teaching SWLV

Objective three was meant to find out the different ways the teachers and SWLV utilize ICT resources to facilitate the teaching process. The data findings are presented according to sub-themes that emerged from the analysis process described in chapter 3 including teachers' use of ICT to teaching, use of ICT by SWLV during teaching, difficult subjects to use ICT and use of ICT in other co-curricular activities.

4.5.1 Teachers' use of ICT to teach SWLV

Participants were asked to state the different ways teachers make use of ICT to teach SWLV in Secondary Schools and the following responses emerged and are presented as bellow:

From the data participants (n=4) mentioned that teachers use ICT to record their work or lessons which they provide to SWLV during teaching as a way of enabling them to access information in the class. They explained that they record on memory cards or a victor reader so that SWLV can listen to the recordings during the teaching or even in their free time. One participant said, *"I can at times record my lesson in Mathematics given that I speak everything using a victor reader and they read as I catch up with other students"* (TR 2). Another participant mentioned: *"Some of the teachers bring the equipment in class and they record the lessons and when we go to the resource room, we listen to what was stored"* (SWLV 4).

The findings reveal that recording is one common way teachers use ICT resources to teach SWLV in secondary schools because it enables them to access content in audio format. However, the narratives also indicate that just a few teachers have attempted to do so, perhaps those who earlier on expressed that they can operate the available ICT equipment. Otherwise, recording work is one of the easy and appropriate ways information can be delivered to SWLV during teaching and teachers should be encouraged to use it.

The participants (n=2) also mentioned that once in a while they use ICT to present work to SWLV in class. They explained that once in a while they access a projector from the head teacher's office and use it to present work including documentaries. One verbal response is presented below: *"Sometimes once in a while, I use a projector for drama and other presentations, for example, projecting a play and then ask them to act"* (TR 5). Another

participant stated: *"I normally buy tapes of legends in history and use a school projector from the office once in a while to concretize the historical events and concepts"* (TR 4).

The finding and the verbal responses suggest that presenting work using ICT is dependent on the availability of the projector which was said earlier that it is not readily available for use by the teachers. However, the projector is one ICT resource that offers access to clear magnified images and text information which is very appropriate for SWLV. It is thus, something that should be promoted for use by teachers in schools.

The data also showed that teachers use ICT resources to enlarge work for SWLV so that they can access information during teaching. They said that they do this by printing large print text notes or enlarge them using a CCTV to enable SWLV to read and follow the lesson. One of the participants shared that:

> Well, for me if they have not printed for me large print, they use a CCTV to enlarge the print so that I can read and do my exercises, tests and even examinations (SWLV 6).

The above narrative and finding reveal that teachers do use ICT resources to provide access to information in magnified format either through printing or using a CCTV camera. A CCTV, for example, is very handy for SWLV in a way that it also provides options for choice of colour contrast appropriate for the user.

The statements above point to the fact that ICT can offer teachers several appropriate media including recording, magnifying text, and presenting work, to promote access to the curricula content or work without having to subject SWLV to the usual tactile method of Braille yet some of them have a usable vision which should be utilized. This is evidenced in TR 2 and SWLV 6.

ICT also lessens the time teachers have to labour to organise and present the learning material to SWLV hence improving the quality of teaching.

This finding concurs with Tedla (2012) who observes that with ICT, teachers can organize content in their respective subjects and present it to students in an accessible format making it easy for them to understand; makes a classroom a playfield where both students and teachers can interact, communicate and collaborate during the time of instruction; keeps students interests and motivations intact and or high in the process of teaching as it makes teaching fun; teachers spend less time and increases the level of participation by SWLV. Edgar Pacheco et al., (2017) observe that on the side of teachers, ICT enriches teaching in a way that they use it for downloading notes and providing access to learning materials online as well as using PowerPoint presentations in enlarged formats to enhance the teaching of SWLV.

However, the results also indicate that a limited number of teachers are making use of ICT perhaps those who mentioned earlier that they can easily operate the existing ICT resources in the ICT facility. The above findings, therefore, show that the use of ICT is also still very low among the teachers in the school as the scope of its utilization in teaching looks narrow or limited. This could be linked to inaccessibility of ICT equipment or other reasons including training. This is indicated in statements by TR 4 and SWLV 4. It is thus vital that teachers are further given in-service training to expand the use of ICT as a teaching tool for SWLV.

On the other hand, participants (n=5) responded differently by saying that no effort has been made to integrate and use ICT to teach SWLV whether in or outside the classroom. This is supported by the verbal utterances below: *"I have not used any ICT resource including a computer to teach the SWLV because of lack of adequate skills"* (TR 3). A similar response was

shared by another participant: *"To be sincere sir, the teachers use less of ICT to teaching us in our school because most of them seem not to know ICT"* (SWLV 1).

The statements above, first reveal that many teachers are not utilizing ICT to facilitate the teaching of SWLV in secondary schools; and secondly, it indicates that SWLV are having a limited opportunity when it comes to obtaining valuable information meant to support their learning while at school. To show that teachers do not use ICT in teaching, some of them are not even aware of the ICT resources available for SWLV. One participant expressed that:

> There is this thing that was brought in by an organization which the SWVI can use to read print". On further probing, (he/she was meaning a CCTV). There is also a system used to change the print to Braille, (referring to an embosser) (TR 3).

This utterance gives an impression that some of the teachers are not only having inadequate knowledge and skills in ICT but others are not even aware or are ignorant about the appropriate ICT resources that SWLV can use during the teaching process in the school. This implies that there are serious gaps that should be fixed concerning the preparation of teachers to enable SWLV's learning in Secondary Schools.

Likewise, Serero (2011) points out that much of the preparatory training teachers had was theoretical or academic and did not prepare them to implement the knowledge in practice and had a negative impact on identifying appropriate ICT resources for teaching SWLV. This trend in schools could be attributed partly due to a lack of the necessary skills in adapting ICT for teaching SWLV but it is also possible that some of them do not use ICT to teach SWLV due to inadequate ICT resources meant for supporting SWLV to access information during teaching. Teachers in Secondary Schools need to be supported in all possible ways to prepare them to become proficient if ICT use is to take root in Secondary Schools for SWLV.

4.5.2 Use of ICT by SWLV during teaching

In this sub-section, the study was interested in finding out the different ways SWLV use ICT resources during the teaching process to access information. The main issues that arose include recording notes/work, magnifying text information, typesetting work, reading text materials and searching for information. They have been presented below:

The participants (n=7) responded that SWLV use ICT resources at their disposal to read their work or notes given by teachers in text format. It was stated that they use a clear reader to scan and read, a victor reader, to convert word documents into audio, computers with JAWS software and CCTVs. One of the participants expressed that:

> Some of the SWLV, CCTVs have enabled them to read without much straining. For example, last year we had a boy who was struggling but with the help of a CCTV, he was able to read with ease for a longer time and even got the first grade. All in all, ICT has enabled our SWLV to access information timely than before (TR 5).

Another one responded that:

> I use a CCTV which is like a TV and I put my book under to read my notes and I have also seen my friends use a clear reader to scan the work and it reads for them (SWLV 5).

The other participant explained that:

> Now like for me, I just take a victor reader because it is the most thing I have always used; I put on my headsets and I listen to the notes" (SWLV 2).

These statements suggest that using ICT resources has greatly enabled SWLV to easily read and access information in the accessible/appropriate formats. For SWLV CCTVs, clear reader and victor reader have become very convenient not only to read information but have improved the performance of some of them.

There are those participants (n=4) who revealed that they use ICT resources specifically to magnify print information both diagrams and text so that they can read and access information

for instructional purposes. They explained that a CCTV has been of great use for this particular activity. One of the participants illustrated: *"For the marlin CCTV, they operate it by fixing the preferred word document under it to enlarge the text to preferred fonts and contrast before reading"* (TR 2). A similar response was shared by another participant who said: *"I have been using a CCTV when the text is so cloudy to enlarge the print so that I can read and revise my notes"* (SWLV 6).

The findings indicate that whereas the ICT resources are meagre in the schools coupled with inadequate preparation of teachers, with a CCTV, SWLV can use their residual vision to have control or independence in accessing information in text format with ease without relying on others to read for them. This means that they have a levelled ground towards access to the curriculum content during the teaching process just like their ordinary counterparts.

There were other participants (n=2) who stated that SWLV use ICT resources especially the computers during teaching to typeset and save their notes or work to have soft copies for future revision. This is illustrated by one of the participants:

> Some of our SWLV who are good at using computers type their work and save them so that they have soft copies of their notes so that they can use them later (SWLV 6).

A similar view by another participant:

> For me as a person, I can get the notes in soft copy and in my O' level I did not copy any notes but used a laptop to learn how to type, and I can format and edit work, listen and read (SWLV 1).

The statements indicate that some of the SWLV have attained skills in using a computer to support them during the teaching process. This should be encouraged as it enables them to have information in multiple accessible formats though the number of those who are competent is still low.

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It also emerged that SWLV at times do record lessons or notes using ICT gadgets such as simple phones and memory cards. They elaborated that the recordings are later played for revision purposes. One teacher said: *"Some of the SWLV use simple phones to record lessons and playing them later for revision while some search for information using the same"* (TR 2).

From the findings, there is a suggestion that recording lessons/notes would be one of the modest ways to access their learning materials in audio format. However, the school does not have a variety of recording ICT gadgets, leaving SWLV to improvise using their simple phones with memory cards. The Secondary Schools ought to ensure that SWLV have access to appropriate recording ICT tools to fully benefit from this particular aspect.

The findings, therefore illustrate that even with the meagre ICT resources provided and a handful of teachers with informally gained knowledge and skills, SWLV have got a levelled ground towards access to curriculum content during the teaching process just like their ordinary counterparts. The findings also indicate that SWLV have recognized that ICT has a direct impact on their learning during instruction. ICT resources such as clear reader, CCTVs, victor readers and computers, are used by SWLV to be able to read, type and save notes, receive audio recorded notes which are all in accessible formats.

Likewise, in the HAAT model, AT is specifically aimed at marking someone with an impairment to perform an activity independently. In this case, SWLV have indicated that even when the ICT resources are not enough or are minimal, they can use them to participate in the teaching process as one of the school activities as emphasized in the model. For example, with a CCTV, SWLV can use their residual vision to have control or independence in accessing information in text format with ease without relying on others to read for them (as emphasized by TR 5). This means

that they have a levelled ground towards access to the curriculum content during the teaching process just like their ordinary counterparts.

Equally, Carriere (2012) reveals that SWLV make use of ICT to take their notes directly on their personal computers or request teachers to send them the course materials in accessible formats by emails or Digital Visual discs or memory cards so that they can access information before, during and or after the lessons thereby enhancing cooperation between the teachers and SWLV. Additionally, Edgar Pacheco et al., (2017) found out that ICT plays an important role of compensating for the impairment and enhancing communication including access to information which is the most significant value of ICT as well as increasing participation in learning. They further note that SWLV can use CCTV to access textual materials especially books; audio recorders to take notes; zoom text software to manipulate text fonts on the computer according to their needs which increase their reading pace and or obtain a larger amount of information from different sources in a dynamic and timely manner. It is there vital for schools to ensure that SWLV have access to an appropriate variety of ICT tools to fully benefit maximally from the teaching process.

Some of the participants (n=3) reported that they normally use ICT to search for information. They revealed that they buy their internet data bundles and use modems and computers at school to search the internet. One participant illustrated:

> I have also been researching on the internet using the laptops of my friends, for example, when I want to get literature textbooks, I type the name of that person who wrote it and the information is brought for me to read (SWLV 6).

Another participant responded: *"I use the internet on my laptop to connect using the internet with other SWLV from other schools to get information for learning purposes"* (SWLV 1).

The findings suggest that while the school does not provide access to wifi to teachers and SWLV, the SWLV incur their costs to access the internet, something which shouldn't be the case. Internet as an ICT resource provides a wider platform where teachers and SWLV can get a vast information for instructional purposes and also interact with other colleagues for purposes of learning.

This is in line with McKnight et al., (2016) who indicate that ICT is used to get access to current and wider teaching resources from the databases for both teachers and SWLV anywhere at school and outside the school; SWLV can search actively for their knowledge by looking for answers online rather than passively waiting for answers from teachers. Similarly, Majinge & Stilwell (2014) report that ICT is utilized to facilitate access to information in accessible electronic databases and on the internet and that it provides equal opportunities to access to information as per the needs of SWLV just like their sighted peers. Likewise, Eguavoen (2016) says that the majority of the SWVI including SWLV (78.6%) apply smart mobile phones while a few made use of personal computers as well as e-learning platforms including the internet.

It is imperative on the side of schools, therefore, to invest heavily in the internet as a resource if they are to foster the teaching of SWLV because it is not cost-effective on the side of SWLV and even to teachers, yet it is very useful for pedagogical purposes.

4.5.3 Difficult subjects to utilize ICT

When asked to identify challenging learning areas to use ICT to teach SWLV, participants (n=8) were quick to express that mathematics and general sciences are quite complex to integrate ICT and teach. When probed to state why they are difficult, they argued that these subjects have a lot of illustrations or diagrams, formulae and symbols which may not be readily accessible using ICT resources. The following extracts attest to this finding: *"The general science and more so mathematics; when I find a symbol, I cannot know what it is and some of the symbols are not there in ICT"* (SWLV 4). Another one said: *"I think it is mathematics and general science because of the many diagrams, formulas and illustrations"* (TR 5).

From these statements, it shows that first, whereas mathematics and sciences have proved to be difficult for ordinary students, they may be more complex to SWLV; Secondly, whereas ICT is thought to reduce the challenges faced by SWLV in accessing vital information for their learning, it has not been satisfactorily used to eliminate those barriers in mathematics and sciences. This is because sciences and mathematics have got complex diagrams, formulas, equations and other illustrations which seem to be very troublesome to access/or understand using the ICT resources

This is in line with the finding of Cryer et al., (2013); Rule et al., (2011) who observe that many Science Technology Engineering and Mathematics (STEM) subjects heavily rely on visual resources such as graphs, diagrams and charts which are inaccessible to partially sighted students and it is difficult to provide accessible resources to these symbolic subjects than other literary-based subjects. They further explain that accessing aspects like equations via audio format, for example, is challenging because, by nature, it is linear. Similarly, with large/magnified print, it is

difficult to access the whole equation at once. They conclude that it is difficult for SWLV not only to access key materials such as notes but also to carry out further reading around the subjects. There is a need to continue exploring how best ICT can be best adapted to accommodate these areas of learning.

4.5.4 Use of ICT outside the classroom

When a question was posed to ascertain how ICT resources are used in other instructional activities outside the classroom, the main issues that came up include entertainment, recording music poems and drama, playing games and accessing schedules for games and sports. They are presented as follows:

From the expressions, participants (n=5) mentioned that ICT is used to watch movies, documentaries and music for purposes of entertainment. They revealed that a school has a projector which is used for this purpose on weekends. This participant said:

> We use them for refreshment to play music for SWLV. This so because some of them believe that they are musicians so they can always borrow some skills from that when they listen to music (TR 5).

Another one said: *"At school, the headteacher provides a projector on the weekend for the students to watch movies"* (SWLV 6).

The findings indicate that ICT resources can be of value for recreation and learning as well because watching and listening to music, movies and documentaries can be educative as they can imitate skills and use them to develop their talents. The results also show that whereas teachers have little access to the projector, it is specifically used to entertain SWLV. The use of a projector, however, should be widened to include presenting lesson content from the core curriculum to increase access to information and consequently participation of SWLV.

Other participants (n=4) mentioned that ICT resources are used in recording music, poems and drama which SWLV later have access to. It was argued that this helps them to relax as well as learn as they listen to the recordings. One participant illustrated: *"At times for me I record drama when my colleagues are performing and then I follow later"* (SWLV 4).

Another one responded:

> I have not done much in this area but always listen to SWLV sing with angelic voices and so they record the songs and poems which are later listened to (TR 1).

From the narrations and finding, it indicates that ICT resources can promote continuity of learning by SWLV even outside the mainstream classroom situation. These recordings of music, poems or even drama help to act as avenues for practising skills learnt in the class or development of talents among the SWLV.

There were participants (n=2) who revealed that ICT resources are used to gain access to games and sports. It was explained that some of these games brain-stimulating and therefore boost the memory of SWLV. One of the participants said: *"Yeah, there are some games which are brain teasers which are installed in these ICT devices for them to play in their free time"* (TR 2). Another participant stated:

> The clear reader is used to read for us timetable for sports so that I can follow what will happen. I also use talking calculators to add points in games (SWLV 4).

These statements suggest that whereas SWLV naturally may have limitations from actively participating in ordinary games, ICT provides an alternative to virtual games which can stimulate their brain and subsequently promote their participation in the teaching process. Besides SWLV are enabled to access information on games and sports events to participate in. This does not only entertain them but can help trigger their development.

From the narrations and findings, therefore, there is an impression that ICT resources to a certain extent promote continuity of learning by SWLV even outside the mainstream classroom situation and also recreation as well because watching and listening to music, movies, documentaries, poems or even dram can be educative as they can imitate skills and use them to develop their own. This is emphasized by SWLV 4, TR 1 and TR 2 in their verbal accounts.

The results also suggest that whereas SWLV naturally may have limitations from actively participating in ordinary games, ICT provides an alternative to virtual games. Besides SWLV are enabled to access information on games and sports events as to participate. This does not only entertain them but can help trigger their development.

HAAT model is very articulate in its explanation. It is advanced that AT designed and prescribed to a person with an impairment has to enable the person to perform school activity including recreation. In this case, SWLV are using ICT, acting as AT to facilitate their involvement in co-curricular activities while at school.

The findings also confirm what Kavcic et al., (2017) who say that all students with visual impairment were excited to play games using computers with a designed perceive-conceive platform, which includes motivating and accessible elements of game-based learning. Furthermore, Söderström and Ytterhus (2010) observe that youths used ICT mainly for entertainment and leisure activities. They further explain that SWLV and visually impaired students generally use ICT and enjoy opportunities with which the internet connection to the computer provide them with including games that are taken as their hobbies.

ICT can indeed be a good source of interesting and educative games and other leisure activities, which can also be brain thought-provoking. However, the fact that these are mostly accessible on

the internet of which resource is not readily available and also there are inadequate tools, making SWLV incur costs to access some of these, implies that a few could be engaged in such useful co-curricular activities. Otherwise, there should be an avenue to make the internet and other ICT resources more affordable and accessible SWLV as well as their teachers.

However, some participants (n=4) stated that they have not used ICT to carry out any other instructional activity outside the classroom. They revealed that they have not made any effort to utilize ICT to facilitate any co-curricular engagements for SWLV. One participant said: *"I have not done anything though I know that computers are used in performing arts, especially in music especially playing music and recording"* (TR 6). Another participant added: *"I have not used ICT equipment we have in the Resource room for any other activity outside the classroom"* (SWLV 5).

The expressions above indicate that the scope of ICT usage for SWLV in secondary schools is still low as teachers have not yet made efforts to enable SWLV to engage in such vital co-curricular activities. As a result, some SWLV, have not attempted to utilize ICT resources for the same activities. This could be associated to; first to the low levels of knowledge and skills in adapting and or integrating ICT in teaching SWLV and thus, not able to also train SWLV to utilize the same; and secondly, the poor attitude that teachers and perhaps SWLV have towards the use of ICT as a pedagogical tool.

Wong Meng Ee and Libby Cohen (2010) observe that with skills and knowledge of teachers disconnected in ICT, how then can SWLV receive instruction including outside the classroom using ICT. This, therefore, limits their ability to explore the possibility of using ICT for co-curricular activities. The knowledge and skills of the few teachers who know how to use ICT

need to be built upon and shared with other staff because only a few of them cannot proficiently use ICT as a pedagogical tool for SWLV in all learning areas.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The chapter presents the summary, the conclusion and recommendations. Additionally, suggestions for further research areas are also presented. These presentations are aligned with the study objectives.

5.2 Summary of findings

The study revealed that low-tech ICT resources are barely available in Secondary Schools. Out of a variety of low-tech devices on the market, only talking calculators were available for use by teachers and SWLV. The study also revealed that high-tech ICT resources are available in ICT facilities but inadequate in quantity and variety. Only 3 computers were adapted to the needs of SWLV, 1 clear reader, 1 victor reader, 2 CCTVs, 1 Braille embosser and 1 printer while internet which is the most highly needed resource in the modern age, and a projector were found not readily available for use by teachers and SWLV.

The study established that teachers only have generic informal training which cannot enable them to pedagogically use ICT in teaching SWLV. Even the one involved in teaching ICT skills to SWLV does not have any formal qualification in ICT. The study findings further revealed that teachers do not have specific training in adapting and integrating ICT in the teaching of SWLV and therefore still novices in their abilities to utilize ICT as a pedagogical tool. Also, the study brought to light that teachers had several barriers towards using ICT as a teaching tool including lack of adequate preparation to obtain knowledge and skills, and inadequate ICT resources coupled with inaccessibility to ICT resources being highly emphasized.

The study revealed that the majority of the teachers do not use ICT resources to teach SWLV in Secondary Schools and the few that have, are minimally using it to record lessons or lesson notes, magnify work and present lessons during the teaching of SWLV. For SWLV, ICT has increased their opportunities to access information during teaching. These opportunities include reading their work, typesetting, storing notes in soft copies, magnifying images and text information, and recording lessons or learning activities. The study findings further indicated that SWLV use the internet to search and access information though at their own cost. The findings also revealed that ICT is used by SWLV in entertainment and other co-curricular activities at school, such as recording and watching movies music and drama, poems and playing virtual games.

The study further established that mathematics and other science subjects are a bit challenging to use ICT in the teaching process due to many illustrations, diagrams, equations and formulas.

5.3 Conclusions

From the very start of this study to the discussion, ICT has been underscored to be a crucial remedy in mitigating barriers towards access to curricula activities by SWLV during teaching. In light of the findings, it is therefore concluded that:

Secondary Schools hardly have low-tech ICT resources while the high-tech ICT resources are available but inadequate compared to the number of SWLV enrolled and therefore ICT facilities are insufficiently equipped with ICT resources adapted to the needs of SWLV.

Secondary School teachers are not adequately prepared in ICT which consequently limits their ability to utilize ICT as a pedagogical tool for teaching SWLV. This is because they have not

undergone appropriate specific training to obtain knowledge and skills in adapting and or integrating ICT in their teaching.

The utilization of ICT resources in teaching SWLV in Secondary Schools is just in the initial stages by both teachers and SWLV though there were signs of willingness on the side of teachers and high enthusiasm on the side of students to use it during teaching.

Whereas the use of ICT resources is still low in Secondary Schools, it has to some extent transformed and increased the prospects and optimism for SWLV in obtaining useful information on curricula activities during the teaching process.

5.4 Recommendations

On the strength of the findings and conclusions arising from this study, the following recommendations may be considered crucial as per the objectives/research questions:

The MoES as a stakeholder in Secondary Schools needs to invest heavily in ICT facilities by ensuring that they are adequately stocked with appropriate ICT resources, both low-tech and high-tech meant for supporting the teaching of SWLV.

Secondary School administrators need to make internet connectivity available to teachers and SWLV since its influence in modern teaching and learning cannot be overlooked or underestimated.

Secondary Schools administrators need to seek partnerships with corporate organizations and Non-governmental organizations to lobby them to facilitate the process of equipping ICT facilities with appropriate ICT resources.

There is a necessity to accord teachers in Secondary Schools opportunities for in-service ICT training by MoES and or school administration, both school-based and external, with specific reference to adapting and integrating ICT in teaching SWLV. This will prepare teachers to have the needed proficiency skills to teach SWLV using ICT in all areas of learning.

There is an urgent need for MoES to restructure curricula for teacher-training institutions and universities so that focus is not only on imparting general ICT skills in teacher trainees in their formative stages as teachers but preparing them to adapt and use ICT as a pedagogical tool in the teaching of all students but specifically those with low vision in Secondary Schools.

Secondary Schools that have enrolled SWLV need to establish a collaborative practice with their sister institutions having similar students with a view of enabling teachers to link up with their counterparts to share and borrow ICT resources and or ideas on how best to adapt and integrate ICT in teaching SWLV.

Secondary Schools should solicit for ICT role models from former SWLV should be co-opted to train or induct teachers and SWLV in skills to enable them to utilize ICT resources in the school.

5.5 Suggestions for further research

Based on the findings of the study and the recommendations, I hereby suggest that:

A study should be carried out in the mere future to explore how best ICT can be used in the teaching of physical and biological sciences to SWLV in Secondary Schools, given the fact that it was mentioned as one of the difficult areas.

Another study should be carried out to examine the stakeholders' role in improving the utilization of ICT in teaching and training SWLV in Secondary Schools in Uganda.

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APPENDICES

Appendix i: Interview guide for teachers

I am Mukhwana Michael, a student at Kyambogo University pursuing a Master's degree in Special Needs Education. I am conducting a research study entitled "Use of ICT in teaching students with low vision in secondary schools.

1. Background information including gender, subjects and classes taught and teaching experience of SWLV

2. **ICT resources available in secondary schools**
   i. What Low-tech ICT resources are available for use by SWLV in your school?
   ii. Which high-tech ICT resources are available for you to use in teaching SWLV in these ICT facilities?
   iii. What is the condition of the ICT facility that is used for teaching SWLV in your school?

3. **Teacher preparedness in using ICT resources to facilitate the teaching of SWLV**
   - What kind of informal training do you have in using ICT for teaching?
   - Which level of formal educational training in ICT have you obtained?
   - What specific training in adapting ICT resources to teach SWLV have you undergone?
   - How do you describe your ability in using the available ICT resources to teach SWLV?
   - Based on your experience, what challenges do you face in an attempt to utilize ICT as a teaching tool for SWLV in the school?
   - What plans do you have to overcome these challenges mentioned above?

4. **How ICT is used as a pedagogical tool for instruction of SWLV in secondary schools**
   - In which ways do ICT resources help you teach academic subjects to SWLV?
   - Which subject areas do you find difficult to utilize ICT to teach SWLV?
   - Besides the above, in which other ways do you use ICT resources to teach SWLV?
   - How do your SWLV make use of ICT during instruction?
   - What is the school planning towards the use of ICT as a teaching tool for SWLV?

THANK YOU FOR YOUR COOPERATION

Appendix ii: Interview guide for SWLV

I am Mukhwana Michael, a student at Kyambogo University pursuing a Master's degree in Special Needs Education. I am conducting a research study entitled "Use of ICT in teaching students with low vision in Secondary Schools.

1. The background information (class, gender, and severity of low vision)

2. **Available ICT resources for use by SWLV in the school**

   a. Identify the low-tech ICT resources made available for you to use during instruction.

   b. Specify the available High-tech ICT resources you have access to for instructional purposes?

   c. In which condition is the ICT facility in your school?

3. **Teacher preparedness in using ICT resources to teach SWLV**

   a. Comment on the way teachers use ICT to teach you in this school?

   b. What challenges do you face when teachers use ICT during instruction?

   c. What are your views on how these challenges can be overcome?

4. **How ICT used as a pedagogical tool in teaching SWLV**

   a. How do your teachers make use of ICT resources to support your learning in the school?

   b. Which subjects do you find difficulties in using ICT during instruction?

   c. In what ways do you make use of ICT for learning purposes?

   d. Apart from the above, which other ways are ICT used for instruction purposes?

   e. What do you think can the school do to improve the use of ICT in teaching SWLV?

THANK YOU FOR YOUR COOPERATION

Appendix iii: Observation guide

Aspect to Observe	Items expected	Available	Comment
ICT resources available in the School	**ICT laboratory/resource Room**	The school has one Computer Laboratory and one Resource Room	The resource room is regularly accessed by the SWLV but the ICT Computer Laboratory is highly restricted and hardly used by teachers and SWLV for instructional purposes
	High-tech ICT resources		
	-CCTVs	2	The most accessible equipment
	-Digital recorders	None	
	-Interactive/smartboards	None	
	-Computers with screen readers	3 laptops	Only 2 accessible to SWLV
	-Computers with screen magnifiers	None	
	-Projectors	1	Not readily accessible for instructional purposes
	-Internet	Limited wifi	Only used by the Headteacher
	-Scanners	None	
	-Photocopiers	None	
	-OCR software	None	
	-Braille embosser	1	It is functional and used by teachers to braille work for SWLV
	-Digital books/notes	None	
	-Large monitors	None	
	-DBT software	One laptop installed	Used by teachers to transcribe print to Braille
	Low-tech ICT resources		
	-Audio recorders	None	Only 4 functional

	-Electronic magnifiers	None	talking calculators found in the Resource room
	-Table lamps	None	
	-Talking calculators	None	
	-Audio players	None	
	-Talking watches	None	
	-Electronic globe	None	

Appendix iv: Introductory Letter

KYAMBOGO UNIVERSITY
FACULTY OF SPECIAL NEEDS AND REHABILITATION
P. O. BOX 6478 KAMPALA
Tel: 041-286237/285001 Fax: 041-220464
Department of Special Needs Studies

17th March 2020

To: The Head teacher
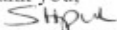Sir Appolo Kagwa Sec School
Mukono

Dear Sir,
Subject: Introductory Letter for Mr Mukhwana Michael

The above mentioned person is a Student in the Department of Special Needs Studies, Kyambogo University. He is registered to pursue a course leading to the award of a Master of Special Needs Education. As part of the course requirements, he is expected to carry out research and submit a report.
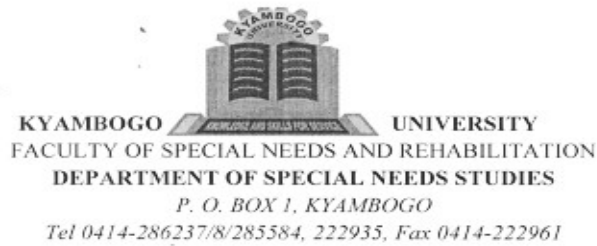
The purpose of this letter, therefore, is to introduce him and to request you to permit him to collect data for his research from your school.

I look forward to your support.

Thank you,

Dr Okwaput Stackus
Head of Department

Appendix v: Letter to the School Administration

KYAMBOGO UNIVERSITY
FACULTY OF SPECIAL NEEDS AND REHABILITATION
DEPARTMENT OF SPECIAL NEEDS STUDIES
P. O. BOX 1, KYAMBOGO
Tel 0414-286237/8/285584, 222935, Fax 0414-222961

26th March, 2020

The Head teacher
Sir Apollo Kagwa S.S, Mukono

Dear Sir/Madam;

Re: REQUEST TO CARRY OUT DATA COLLECTION FROM YOUR SCHOOL

I hereby submit my request to your office as indicated in the reference above. I am a student of Kyambogo University pursuing a master's degree in Special Needs Education tenable in the Department of Special Needs Studies. Currently, I am conducting a study on "Use of ICT in teaching Students with Low Vision (SWLV) in Secondary schools and I have embarked on a data collection exercise as a requirement for the award of that degree. My study is targeting Secondary Schools in Mukono District and in particular the teachers and SWLV. This school has been chosen because it is one of the few model secondary schools in Uganda that have embraced the education of SWLV. Thus, your institution is expected to have relevant information to answer the research questions for this study.

My study is purely qualitative and I am using interviews to collect data but I also request to be allowed to observe one or two lessons being conducted for SWLV. The purpose of this letter therefore is to request your office to grant me permission to get information for my study.

I will be grateful if my request meets your kind consideration. Attached are copies of my University Identity Card, Introductory letter and admissions letter from Kyambogo University.

Thank you

Yours sincerely,

MUKHWANA MICHAEL
mmukhwana@kyu.ac.ug/0783270372

Appendix vi: Letter to the Participant

KYAMBOGO UNIVERSITY
FACULTY OF SPECIAL NEEDS AND REHABILITATION
DEPARTMENT OF SPECIAL NEEDS STUDIES
P. O. BOX 1, KYAMBOGO
Tel 0414-286237/8/285584, 222935, Fax 0414-222961

16th March, 2020

Dear Participant,

RE: REQUEST TO PARTICIPATE IN THE RESEARCH STUDY

I write to you as per the reference above. I am a student of Kyambogo University pursuing a Master's Degree in Special Needs Education tenable in the Department of Special Needs Studies. Currently, I am conducting a study entitled "Use of ICT in teaching Students with Low Vision in secondary schools", and your school has been identified as an entity for data collection. The purpose of this letter is therefore to humbly request you to become a participant in this study. The information you will provide is strictly to be used for academic purposes only and as such will be treated confidential. You are free to withdraw if you feel uncomfortable to proceed with the participation.

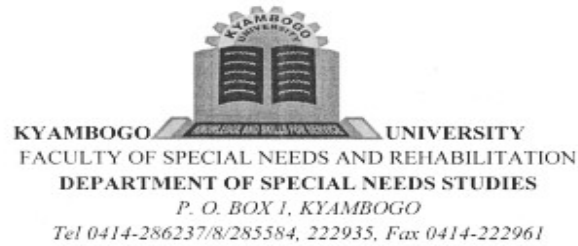I will be very grateful if you positively consider my request. I thank you

Yours sincerely

MUKHWANA MICHAEL
mmkhwana@kyu.ac.ug/0783270372

Appendix vii: Consent Form

KYAMBOGO UNIVERSITY
FACULTY OF SPECIAL NEEDS AND REHABILITATION
DEPARTMENT OF SPECIAL NEEDS STUDIES
P. O. BOX 1, KYAMBOGO
Tel 0414-286237/8/285584, 222935, Fax 0414-222961

CONSENT FORM

Dear participant,

I am a student of Kyambogo University pursuing a master's degree in special needs education. I am carrying out a Research study on "Use of ICT in teaching Students with Low Vision (SWLV) in Secondary schools". It is hoped that the findings of the study will help to enlighten the educators on how ICT as an innovation can be adapted to facilitate teaching of SWLV and provide useful information to Ministry of Education and Sports as well as other stakeholders for policy formulation, planning, developing and providing appropriate ICT resources in Secondary Schools in the country.

You have been identified as one of the participants who can inform the study through an interview. The interview will focus on the nature of ICT resources the school has, the competence of teachers to use ICT for teaching SWLV and the actual use of ICT in teaching. The interview is likely to last 25-30 minutes. The purpose of this letter is to request you to participate in the study. Whatever information you will provide will be used for the purpose of the study and academics only and will be kept confidential. You will also be free to withdraw from the study in case you feel uncomfortable to proceed with the participation.

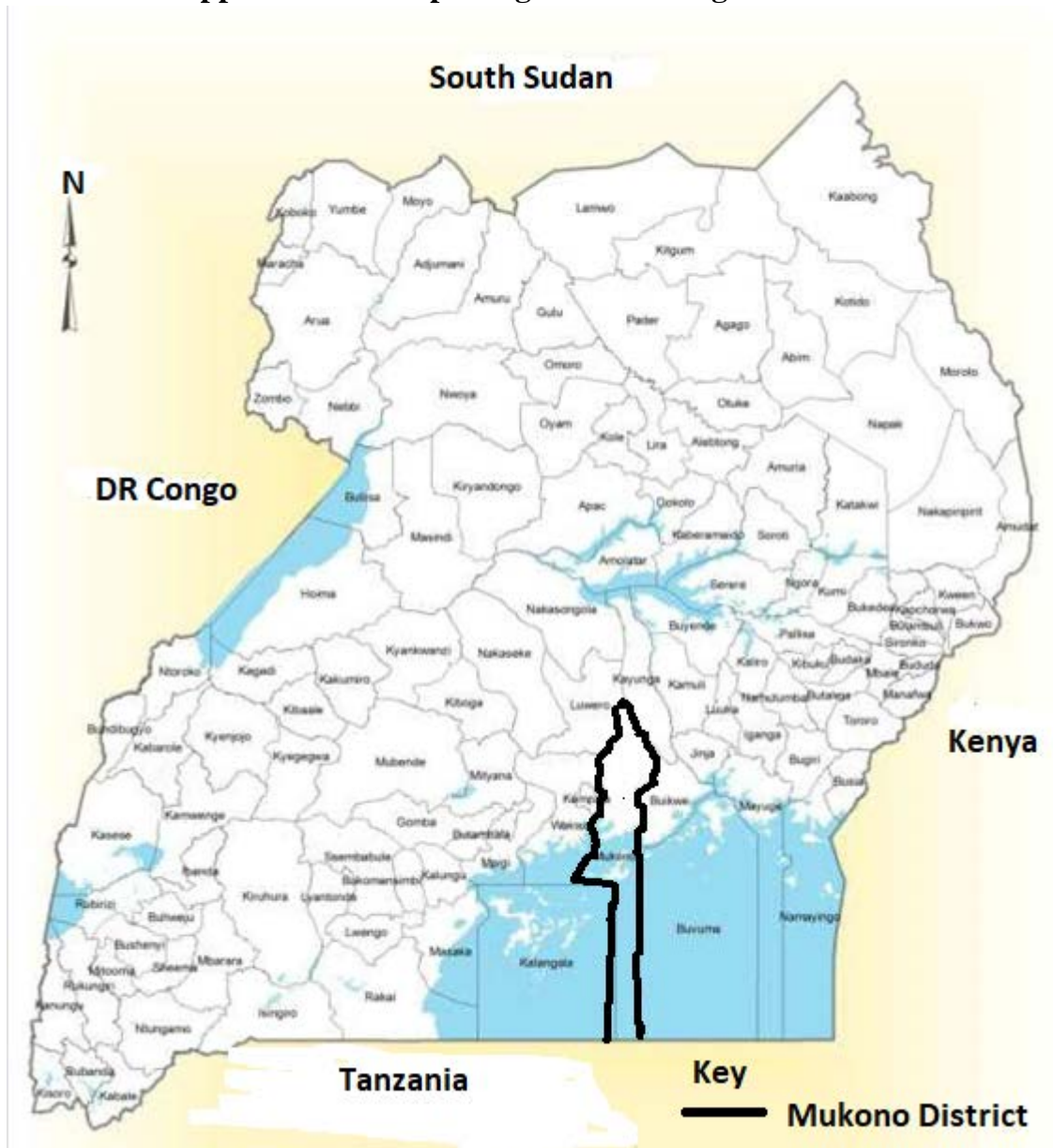Thank you very much for your support and co-operation in advance

Yours sincerely

MUKHWANA MICHAEL

Confirmation of acceptance

I have read and understood the purpose of the study and I hereby consent to participate.
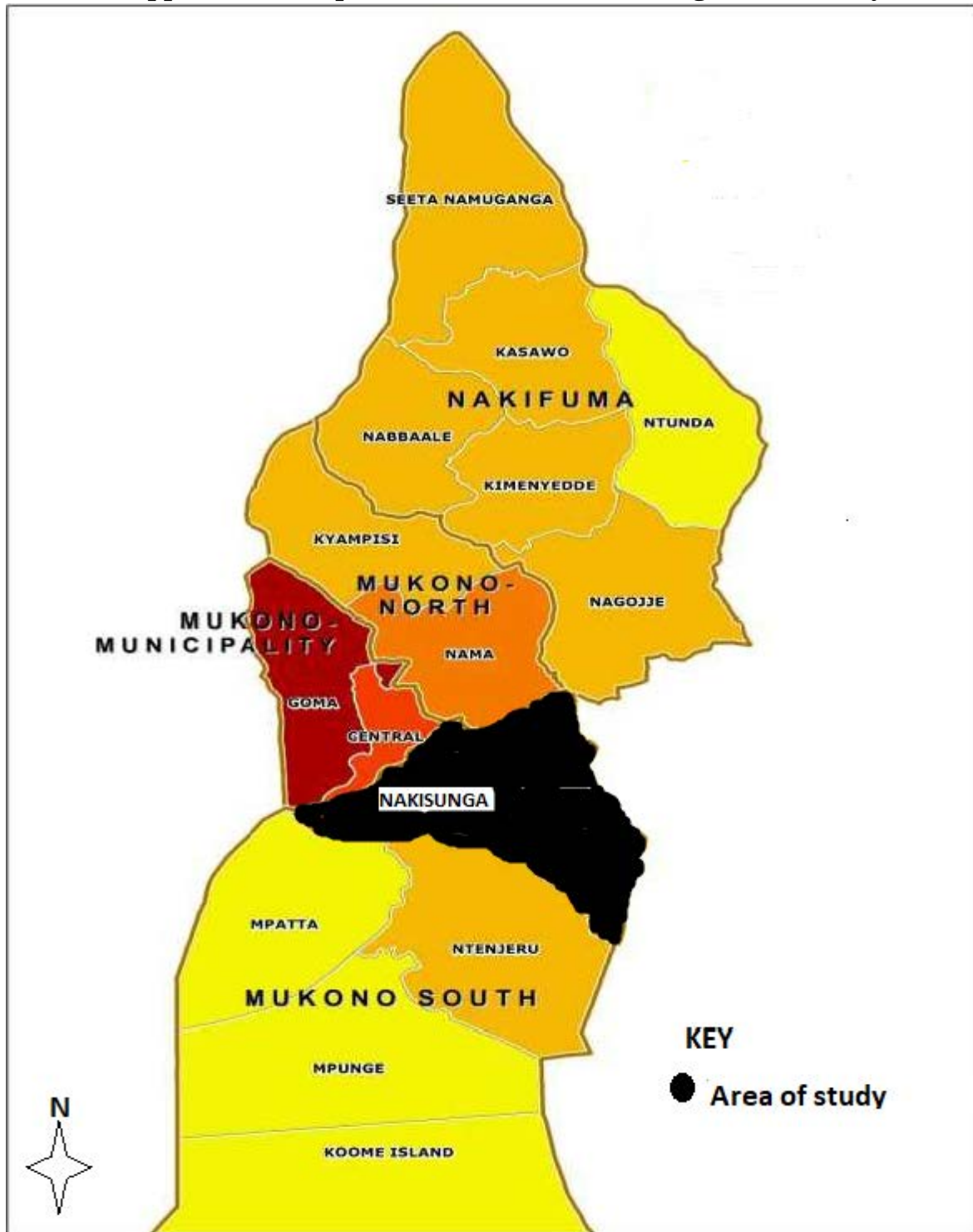
Signature:……………………………………Date :…………………………………

Appendix viii: Map of Uganda Showing Mukono District

Source: Adapted from Uganda Bureau of Statistics, 2017

Appendix ix: Map of Mukono District Showing Area of Study

Source: Uganda Bureau of Statistics, 2017