ASSISTIVE TECHNOLOGY USE IN EDUCATION OF STUDENTS WITH VISUAL IMPAIRMENT: A CASE STUDY OF ANGAL AND PAROMBO SECONDARY SCHOOLS IN NEBBI DISTRICT.

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A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND GRADUATE TRAINING IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF THE DEGREE MASTERS IN SPECIAL NEEDS EDUCATION OF KYAMBOGO UNIVERSITY

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DECLARATION

I, Owachgiu Christopher, hereby declare that this research dissertation under the title **"Assistive technology use in education of students with visual impairment: A case study of Angal and Parombo secondary schools in Nebbi District"** is my original work and has never been submitted for any academic award in any institution or university except where due reference is clearly exemplified in the text.

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APPROVAL

We certify that this research dissertation entitled **"Assistive technology use in education of students with visual impairment: A case study of Angal and Parombo secondary schools in Nebbi District."** by Owachgiu Christopher has been carried out under our supervision and is now ready for submission to the graduate school with our approval as supervisors.

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DEDICATION

I dedicate this dissertation to my father, Mr. Onega John Mambo (RIP), and my mother, Mrs. Akello Esther, not forgetting my dear wife, Mrs. Ozunga Doreen, who have stood with me all the way through this academic journey up to the end.

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LIST OF ACRONYMS

AT:	Assistive Technology
CCTV:	Closed Circuit Television
CD:	Compact Disc
CDT:	Critical Disability Theory
CRPD:	Convention on the Rights of Persons with Disabilities
DIS:	District Inspector of schools
DSA:	Disabled Students Allowance
GATE:	Global Assistive Technology
IEP:	Individual Education Plan
JAWS:	Job Access with Sound
MOES:	Ministry of Education and Sports
NDLG:	Nebbi District Local Government
PWDs:	Persons with Disabilities
PWVI:	Persons with Visual Impairment
SNE:	Special Needs Education
SWD:	Students With Disability
SWVI:	Students with Visual Impairment
UBOS:	Uganda Bearuer of Statistics
UK:	United Kingdom
UN:	United Nations
UNESCO:	United Nations Education Scientific and Cultural Organization
WHO:	World Health Organization

ABSTRACT

Worldwide, the use of assistive technology in the education of students with visual impairment has the potential to improve their academic performance and learning capacity. This study, therefore, examined the use of assistive technology in education of students with visual impairment in secondary schools. The study was guided by the following objectives; the types and conditions of Assistive Technology; how effectively assistive technology is being used in education of Students with visual impairment and perceptions of students with visual impairment towards the use of assistive technology. The study was guided by Critical Disability Theory as a theoretical framework to try to understand the effectiveness of using assistive technology in the education of students with visual impairment. A case study design of the qualitative approach was used. The participants for this study was the students and resource room teachers. The semi-structured interviews and observation methods were used in collecting the data. Data obtained were thematically analyzed. The findings revealed that there are varieties of assistive technology in the resource rooms but they were few in numbers and students with visual impairment and their teachers lacked the necessary skills and competency to use the available assistive technology, there was irregular power supply; students with visual impairment and their teachers were aware of the positive impacts of assistive technology on their learning, and both teachers and students with visual impairment had positive attitudes towards the use of assistive technology. The study recommended that schools should form alliances with other interested parties for the provision of suitable Assistive Technology equipment; schools with students with visual impairment must form partnerships with sister institutions; the Ministry of Education and Sports should make sure secondary schools have enough assistive technology to support students with visual impairment; there is need for Continuous Professional Development for secondary school teachers on the use of assistive technologies and the school administrators should prioritize repairing the available assistive technology.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

The study aimed at finding out how assistive technology (AT) is used in secondary schools in the education of students with visual impairments (SWVI). In this chapter, the background of the study, the statement of the problem, purpose, objectives, research questions, scope, significance, definition of terms, and theoretical framework are presented.

1.1 The Background of the Study

Visual impairment (VI) encompasses two groups with different needs and characteristics: those with low vision and those with blindness (Kapinga & Aloni, 2023). Low vision refers to a loss of visual acuity with some remaining vision. It pertains to people with sight who are unable to read a printed text at a viewing distance. Students with low vision (SWLV) need changes to the lighting or print to read things (Manitsa & Doikou, 2022). There are two distinct types of low vision: myopia or being unable to see objects clearly at a distance, also known as being "near-sighted," and hyperopia, or being unable to see objects up close, also known as being "far-sighted."

Blindness is having a vision in the better eye that is less than 20/200 or a field of vision that is 20 or smaller at its widest point. Students who are blind require accommodations to access the content of visually presented materials, like Braille, raised-line symbols, audio recordings, and/or other non-visual media (Agostino, Arnaboldi, Lema, & Management, 2021).

According to WHO (2020) worldwide, 1.1 billion individuals have some sort of visual impairment, thus, 43 million have blindness, 295 million have a moderate to severe impairment, 258 million have a mild impairment, and 510 million have problems with their near vision. Between 1990 and 2020, blindness among individuals aged 50 years and older declined by 28.5%, while the prevalence of mild visual impairment decreased slightly (3.23% to 2.5%) and the prevalence of moderate and severe visual impairment increased slightly (-0.3% to -0.2%). By 2050, the WHO 2020 61 million people are estimated to be blind, 474 million will have moderate to severe visual impairment, 360 million will have mild visual impairment, and 866 million will have uncorrected presbyopia according to WHO forecasts for the year 2020.

In the same vein, an estimated 3.1 million people in Uganda have some form of vision loss - from mild to total blindness, according to the International Agency for the Prevention of Blindness in 2020. Some 83,000 people (0.6% of the population) are blind, while almost half a million have moderate to severe low vision. However, the enrolment of student with visual impairment in Ugandan secondary schools stands at 46% of the total enrollment of students with disabilities (Rabi et al., 2020). However, (WHO, 2020) estimated that SWVI in Uganda is at 34% of the total population of school going children with disabilities, with Nebbi district registering 43 students with visual impairment out of 116 students with disabilities in 2023 this stands at (37%). Reflecting on this indicator, there is a signal that a good number of students with visual impairment are in secondary schools in Uganda. Like any other district in Uganda, student with visual impairment in this district is receiving secondary education through integration into mainstream classes (Kaplan, 2022).

Also, estimates indicated that visual impairment is four times higher in low and middle-income countries than in high-income countries. In high-income regions of North America, Australia, Western Europe, and Asia-Pacific, the low vision rates are lower at 10%, and in western, eastern, and central sub-Saharan Africa the rate is 80% (WHO, 2018). There is a likelihood that more people will contract visual impairment due to population expansion (Willemze et al., 2019). However, there are significant differences in the cause of visual impairment in each country due to accessible and affordable eye care services (Dakwa, Chiome, & Chabaya, 2014). Student with visual impairment can also have lower levels of academic success, social isolation, and a higher risk of falls and fractures (Bamu et al., 2016).

Assistive technology is a wide range of devices that can be used by people with disabilities to compensate for a variety of specific skills including adaptive and rehabilitative ones (Dakwa et al., 2014). Assistive technology is associated with components that include braille display, magnifiers, screen reading software, large print materials and so forth. The assistive technology for low vision includes; audio labelers, braille, AI smart glasses devices while blind includes screen readers, speech access, cane's and refreshable braille displays. According to Dell et al., (2018) Assistive technologies (ATs) are designed to improve the functional capabilities of people with disabilities. Some are relatively low-tech and very familiar such as reading glasses, crutches and hearing aids. Others are more advanced, using cutting-edge science and technology.

Less than 10% of the people that need assistive technology are able to get it (WHO fact sheet on assistive technology 2018). Dell et al., (2018), students with

disabilities may use assistive technology to increase, maintain, or improve their capacities. Assistive technology is a wide range of devices that can be used by people with disabilities to compensate for a variety of specific skills, including adaptive and rehabilitative ones (Dakwa et al., 2014). WHO Global Disability Action Plan (2014–2021), asserts that assistive technology ranges from low-tech devices to high-tech devices. A very small percentage of student with visual impairment have access to assistive technology (Talapko et al., 2019). However, WHO-GATE strives to increase accessibility to excellent, cost-effective AT. The Assistive Products List (APL) for students with visual impairment was published in 2016.

Alternatively, assistive technology can assist student with visual impairment in all academic areas, including an expanded core curriculum. The absence of assistive technology in students with visual impairment's education makes them educationally marginalized (Bruce et al., 2016). Eyuboglu et al., (2021) assert that low-tech tools often don't use electronics and are simple to use. Examples are pencil grips, highlighter tape or pens, and modified furniture, which are generally accessible, inexpensive, and low-maintenance. Mid-tech equipment only needs basic maintenance and can be operated electronically with little training. Mid-tech products, such as modified keyboards, electronic dictionaries, and tape or digital recorders, are widely accessible and typically reasonably priced.

Complex electronics are used in high-tech devices, which typically have microprocessor components for data storage and retrieval that is expensive, necessitate regular maintenance, and require substantial training and which

makes it challenging for student with visual impairment and their teachers to access these resources (Ramona McLaughlin & Cheryl Kamei-Hannan, 2018).

However, according to Nduvu (2021), there is an important connection between teachers' knowledge and assistive technology for the student with visual impairment, which requires their perception to be positive to help their students use assistive technology. Lidstrom & Hemmingsson (2014) state that students' individual educational needs, which require teachers to employ new changes in technology for educational purposes such as using assistive technology devices as a tool to foster student learning in and outside classrooms, have been affected due to limited skills, competency, and exposure to AT, which contributes to the students with visual impairment's inability to easily understand the subjects at the expense of other ordinary students. In the same vein, Rosner & Perlman (2018) assert that assistive technology for student with visual impairment has the potential to improve their academic performance and learning capacity, and the absence of it enables other ordinary students to command a lot of gaps in their performance over student with visual impairment. The absence of assistive technology results in social injustice, discrimination, and marginalization of student with visual impairment (Argyropoulos et al.,2017).

In the United Kingdom (UK), the Disabled Students Allowance (DSA) fund provides eligible student with visual impairment with appropriate assistive technology that can help them enter formal education effectively (Rosner & Perlman, 2018). The DSA is provided to schools via several financing agencies. It is used to pay for human resources like note-takers and translators as well as to buy assistive technology like screen readers, text-to-speech systems, voice

recognition software, and alternate input devices. The DSA also gives money for student with visual impairment's additional travel expenses to and from school, internet access, Braille paper prices, and photocopying expenses. It can be argued that the UK's provision and usage of assistive technology are successful due to the effective implementation of policies holding the government accountable for their duties and the level of developed technology in the nation, which is in contrast to developing nations like Uganda.

There has been an increase in concern for and dedication to using assistive technology in the education of student with visual impairments in Africa, particularly by disability organizations (Wang et al., 2016). Higher education institutions in South Africa are more overt in their usage of assistive technology in students with visual impairment education. Educational institutions have undergone a complete transformation to better accommodate all types of learners, including those who have visual impairments (Cheung et al., 2016). Through disability organizations, assistive technology is made available, with funding coming from the South African disabled students' allowances. The DSA is a fund for students with disabilities, including students with visual impairment (Allman & Lewis, 2014), which is not the case in Uganda as students with visual impairment continuous to struggle with assistive technology's use in their education..

Additionally, in South Africa, the use of assistive technology for students with visual impairment primarily focuses on impairments in cognition, communication, vision, and movement. Prosthetics, eyeglasses, and white canes are a few examples of assistive technology that students with visual impairment

uses (Sankhi & Sandnes, 2022). Thus, students with visual impairment in South Africa are given access to numerous low and high-tech devices for their schooling. Although secondary education in South Africa provides for AT and promotes its use (Ramona McLaughlin & Cheryl Kamei-Hannan, 2018), students with visual impairment continues to be excluded from learning because of teachers' and sighted students' negative attitudes toward them. But in the Ugandan context, its challenging to use assistive technologies for the benefit of students with visual impairment due to unfavorable attitudes from users and those in authority as a result of inadequate knowledge regarding student with visual impairment's education.

In Uganda, the need to embrace the goal of lifelong education for all with its information communication technology (ICT) policy was established in 2003. In 2014, UNPRPD, UNICEF, and UNESCO in partnership with the line ministries and disability organizations, including Enabling Services Limited (ESUL), piloted a project on the use of assistive technology to ensure inclusive education. The Global Disability Innovation Hub (GDI Hub) was invited by UNICEF to specifically evaluate the usability of the AT deployed in Ugandan primary and secondary schools in 2015.

Between April 15 and May 9, 2019, UNICEF obtained a usability report and visited some Ugandan schools between April 22 and April 26, 2019. Assistive technology users are also identified as teachers, students with visual impairment, and their parents. According to Morgado et al., (2019), the usability of the assistive technology is reliant on the technology's accessibility and availability, user training, and management. Some teachers were found to be trained to use

the assistive technology. Students with visual impairment have been able to engage better in lessons and viewed the assistive technology intervention as another teacher. Some of the assistive technology's provided to the schools were found to be laptops, a video projector, a Victor reader, and speakers, which not all teachers were competent enough to use (Kearney-Volpe et al., 2019). However, (Ade et al., 2014) assert that parents are aware of the needs and challenges of students with visual impairment who are marginalized in their education.

Similar findings indicated that students with visual impairment did not always have access to the same educational resources as their peers. In contrast to their sighted classmates, who can access written text, students with visual impairment must rely on other formats for books, such as large print or Braille (Prentice et al., 2021). Even though secondary schools welcomed students with visual impairment, not much is being done to include the feature of assistive technology to help these students learn efficiently due to the unfavorable opinions of teachers who discriminate against students with visual impairment (Bamweyana et al., 2020).

According to Barbareschi et al., (2021), the entire secondary education environment is not changing in response to the access needs of admitted students with visual impairment. Secondary schools in Uganda do not adopt disability policies; students with visual impairment is given few admissions possibilities, lacks support services, and has difficult-to-access libraries, accommodations, delivery methods, and evaluation methods (Emong, 2014). However, assistive technology is evolving into a more tangible tool for students with visual

impairment in schools to access communication, information, and social inclusion (Prentice et al., 2021).

To the contrary, the effective use of assistive technology devices in secondary schools in Uganda remains to a large extend out of reach for students with visual impairment as most schools are in their early decisive phase of assistive technology adaptation, characterized by unreliable provision and use despite its advocacy as the potential to improve the academic performance and learning capacity of students with visual impairment. Kiyingi (2020), asserts that most of them lack the knowledge and expertise necessary to use the assistive technology's effectively during the learning process. It's against this background, the researcher was compelled to examine the use of assistive technology in the education of students with visual impairment at secondary schools level using Nebbi district as a case.

1.2 The Statement of the Problem

The use of assistive technology in the education of students with visual impairments has gained relevance and has a lot of promise in enhancing students' learning outcomes (Sen, 2024). Students with visual impairment can use assistive technology to increase, maintain, or improve their learning capacities and their academic performance (Szostak, 2024). Despite the efforts by the government of ensuring inclusive learning in secondary schools, there is still knowledge gap towards adoptive and usability Assistive Technology by students with visual impairments remains low (NUDIPU Report, 2020). In light of this, the researcher was compelled to carry out the study to understand on the extent to which

Assistive Technology are used in education of students with visual impairments in Uganda using Nebbi district as a case study.

1.3 The Purpose of the Study

The purpose of the study was to examine the use of Assistive Technology in the education of Students with visual impairment in secondary schools in the Nebbi District.

1.4 The Objectives of the Study

The study was guided by the following specific objectives;

I. To establish the types and condition of assistive technology in the secondary schools in the Nebbi district.
II. To investigate how assistive technology is being used in the education of students with visual impairment effectively in secondary schools in the Nebbi district
III. To explore the perception of students with visual impairment towards the use of assistive technology in secondary schools in the Nebbi district.

1.5 The Research Question

I. What are the types and conditions of assistive technology in the selected secondary schools in Nebbi district?
II. How is assistive technology being used in the education of students with visual impairment effectively in secondary schools in the Nebbi district?
III. What is the perception of students with visual impairment and teachers towards the use of assistive technology in the selected secondary schools in Nebbi district?

1.6 The Scope of the Study

1.6.1 The Content Scope

The study focused on examining the use of assistive technology in the education of students with visual impairment, particularly the types and condition of assistive technology, the effective use of assistive technology by students with visual impairment, and the perceptions of students with visual impairment towards the use of assistive technology in secondary schools.

1.6.2 The Geographical Scope

The study was conducted in Angal and Parombo secondary schools in Nebbi district, West Nile sub-region, in northern Uganda. The district has eight government-aided secondary schools and nine private secondary schools with a total of 43 students with visual impairment.

1.6.3 The time scope

The study was conducted within the period of one year, from May 2023 to October 2024.

1.6.4 The Significance of the Study

The findings may enable the Ministry of Education and Sports to gain insight into how students with visual impairment and their teachers use assistive technology in secondary schools and therefore make appropriate adjustments to streamline the use of Assistive Technology in students with visual impairments' education.

The findings may also help other researchers intending to carry out similar studies with references to produce more detailed and updated research in the same area.

1.7 Definitions of Terms

Visual impairment: The term "visual impairment" (VI) encompasses two groups with different needs and characteristics: those with low vision and those who are blind (Kisekka et al., 2023). The term visual impairment in this study has been used to refer to both low vision and total blindness.

Assistive technology: Refers to the devices that are used to increase, maintain, or improve the capabilities of students with disabilities (Szostak, 2024). Assistive technology in this study has been referred to the both low tech and High-tech devices used in the education of students with visual impairment.

Education is the process of imparting and acquiring knowledge, skills, attitudes, and preparing oneself or others intellectually for a mature life. Education in this study has been used to mean how learners with visual impairment effectively learn.

Inclusive education: Increasing engagement in learning and eliminating exclusion from education are two ways that inclusive education, as defined by (UNESCO, 2008), addresses and responds to the diversity of needs of all students. Inclusive education in this study has been refer to situation where students with visual impairment learn and interact together with other learners without visual impairment in the same school and class.

Low-tech: these are devices that have low technology right from the time of manufacturing to the user's hands; for example, a white cane, hand-held magnifiers, and Braille slates.

Mid-tech: these are devices that have medium technology right from the time of manufacturing or use. Examples include a talking watch, an audio recorder, and a talking calculator.

High-tech: these are devices with high technology involved in them from the time of manufacturing to their use; examples are smartphones, computers, and scientific calculators.

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

The core curriculum is a set of planned content that are common to all students, such as languages, mathematics, physical education, science, and social studies. In this study core curriculum has been used to mean what has been planned for all students to learn in the classroom setting by their teachers.

1.8 The Theoretical Framework

The study was guided by Critical Disability Theory (CDT) which was established in the late 1990s will serve as the theoretical foundation for this investigation. CDT stems from the critical social theory that Max Horkheimer first proposed and has since developed into a large family of critical theories with numerous methods for social research. Many post-conventionalists, post-structuralists, and post-colonialists who find most of their inspiration in Michel Foucault, Judith Butler, and Jacques Derrida's ground-breaking work are among its followers.

They aim to create a new viewpoint on disability as an identity marker, similar to race and gender. They claim that absence of access to necessary assistive technology enable people with disabilities experience social injustice, marginalization, and discrimination. Therefore, one could argue that the CDT is about integrating all different types of people into society while adapting to their functional needs.

The first component of CDT is "models of disability," which centers on disability and the perspective of their needs to be sufficiently included in society. The key concern is the failure of society to accommodate differences that limit an individual's life options.

The second component "multidimensionality," is a means to avoid the pitfalls of exclusion and conformity and to reflect the reality that people are diverse and variable within any particular social structure; therefore, it is necessary to provide AT devices for them to function in the society in which they live.

The next component is "valuing diversity." This is being identified, and as a PWD, it's central to understanding oneself and one's position, with its attendant opportunities and limitations. CDT recognizes and welcomes the inevitability of difference and conceives of equality within a framework of diversity.

Lastly, "rights" highlights how liberal rights theory has fallen short of meeting the needs and interests of PWD both individually and collectively by failing to take into account the diversity of PWD within the context of its idea of equality. Disability responses that aim to make people with disabilities invisible are fundamentally incapable of adequately defending PWDs' rights to participate fully in society.

The main idea of CDT is that disability is a social construct rather than an inescapable outcome of impairment. PWD suffer from disadvantages due to the environment's inadequate response to their variety of needs. The CDT seeks to contradict established, hegemonic, and restricted viewpoints. According to a bottom-up view, the performance gaps already present in the diversity of disabilities can only be filled by assistive technology. To support and provide context for the supply of assistive technology to students with visual impairment in secondary schools, this study will use the CDT as a theoretical framework to clarify and aid in understanding the secondary education system in Uganda, particularly the use of assistive technology in the education of students with visual impairment.

1.8.1 Relevance of Critical Disability Theory (CDT) to the Study

The theory echoes well in this study that "valuing diversity," which in this case means students with visual impairment has diverse needs and has to interact with the different types of assistive technology in their school, ranging from low-tech to high-tech, to enhance their full participation and engagement in the education, Although not all different types of assistive technology were available in schools for students with visual impairment, in this study, the assistive technology referred to in the CDT included any high-tech, mid-tech, or low-tech devices that are being used by students with visual impairment to make them function among other ordinary students without any discrimination. Students with visual impairment is frequently perceived as limited and linked to incapacity, even though when assistive technology is provided to them, they may function well without any discrimination, which therefore enhances their academic credentials.

Nevertheless, the type of activity in which students with visual impairment is engaged determines the type of assistive technology to be used.

Additionally, in assisting students with visual impairment in understanding the setting in which assistive technologies are used, there is a need to consider accessibility. This is essential because learning occurs in a variety of settings, and there is a need to be accessible and appropriate, including well-lit classrooms and compounds, ramps and walkways for accessing learning facilities, and the arrangement of seats and assistive technology equipment in classrooms. An instructional policy on the access and use of assistive technology also has implications for how students with visual impairment can use assistive technology in their education. The teachers and students with visual impairment have to be knowledgeable and skilled in the use of assistive technology for effective utilization of the available assistive technology. This theoretical idea prevents over-generalizations in terms of the use of assistive technology in the education of students with disability. If teachers and students with visual impairment have access to adequate and appropriate assistive technology facilities, the use of assistive technology in their education is likely to be achieved in a mainstream setting.

Lastly, the CDT theoretical idea were used in this study to explain how students with visual impairment and their teachers perceive the provision of assistive technology in their education and how, as unique individuals, they are either enabled or constrained in the delivery of education. The negative attitude towards students with visual impairment is a burden, and therefore, may be related to the marginalization, discrimination, and social injustice of such individuals. In this

case, the CDT is essential for comprehending perceptions and their implications in an area of social-cultural context, including attitudes of teachers and students with visual impairment towards the use of assistive technology as well as perceptions of ordinary peers towards students with visual impairment, which may determine how well assistive technology is applied in their education.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter reviewed related literature based on the problem under study. The current study explores assistive technology use in the education of students with visual impairment especially at secondary level; this was done in accordance with the research objectives.

2.1 The Types and Conditions of Assistive Technologies for Students with Visual Impairment in Secondary schools

In the education process, assistive technology offers various solutions to provide students with visual impairment with support that meets their needs (Davies, 2013). Several assistive technologies are available to support the students with visual impairment in their education such as televisions, computers, the internet, telephones, and smartphones (Boucher, 2018). Perras (Abascal & Nicolle, 2015). on the other hand, studies indicated that visual impairment is variable in type, levels, and time of onset (Fernandez-Cisneros et al., 2024). For that matter, even the kind of assistive technology they require may differ accordingly. According to Ferrell (2017), students with visual impairment requires screen readers and screen magnifiers, speech, text, and Braille conversion technology, computer installed with screen reading software, digital tape recorder braille note taker, Braille embosser refresher Braille display, word processors, talking dictionary, talking watch, and screen reader software to access education.

Research demonstrates that the combination of touch, speech, and residual vision has increased communication choices for students with visual impairment

(Miele& Lesgold, 2016). For students with visual impairment, there is a variety of software, such as the use of modified computers to speak using synthesized voice and screen-reading software for the blind. In industrialized nations, they have been evaluated and employed in education. The common assistive technology for students with visual impairment are eyeglasses, white cane, balls that emit sounds audio materials like talking books, and audio recorded lessons, sophisticated-audio cassettes CD players, and recording machine (Johnson, 2013).

According to the U.S. Government (2018), Assistive technology is a combination of hardware and software products, such as screen readers and voice recognition products, that provide essential accessibility to computers for those with significant vision, hearing, learning, and physical impairments (Theofilou & Psillaki, 2024)

In another study which found out that all students, including students with visual impairment, might greatly benefit from improved access to inclusive education curriculum through assistive technology, such as adaptive and rehabilitative equipment for students with visual impairment (Johnson, 2013). According to (Maurya, 2018), "pretty much anything that might be used to compensate for a lack of certain abilities" can be low-tech, like crutches or a specific pen grip, or high-tech, such as computers with specialist software for teaching dyslexics to read (WHO, 2016). The term assistive technology describes the tools and services used to expand, preserve, or enhance a student with a disability's capabilities (Johnson, 2013).

Similarly, students with visual impairment can benefit from assistive technology in all subject areas and the extended core curriculum (Johnson, 2013). Going way back to the ancient civilizations who used various types of assistive technology, like the long cane, for independent travel, the assistive technology has a long history of being successfully used by students with visual impairment. Since then, a wide range of devices have been created to help students with visual impairment access information, travel on their own, and engage in meaningful activities. Almost everyone with visual impairment can benefit from visual rehabilitation, which can help them make use of their remaining eyesight (Johnson, 2013).

According to a paper by Assie, (2021), the National Capital Region Libraries in India currently have a variety of assistive technology facilities available for those with impairments. Data from various institutions and libraries that serve individuals with impairments was gathered using a questionnaire as part of the fundamental research technique (Sanaman & Kumar, 2014). 15 libraries in all were chosen for the investigation. The study showed the dearth of assistive technologies in libraries in the National Capital Region and concluded that these resources are scarce for users who are loco-motor, visual, and hearing challenged (Kumar, 2014). However, many libraries lacked adequate assistive technologies to cater to the needs of students with visual impairment. The National Capital Region Libraries, India, have suggested that assistive technology professionals be utilized in a variety of libraries around that country (Kumar, 2014).

The world over, assistive technologies that are being taken into consideration are, JAWS, Window-Eyes, Refreshable braille displays, a screen-reading program, Zoom Text magnifier/reader and Zoom Text keyboard, Dragon Naturally

Speaking, a scanner/reader, a talking calculator, a voice recorder, a CD player, and speech synth. These devices are all important in the lives of students with visual impairment, but most of them are expensive, especially in Africa. According to the study, this is also a problem in India (Ferrell, 2017).

In addition, assistive technology products are divided into three group; low-tech, mid-tech, and high-tech (Torous & Blease, 2024). Low-tech gadgets typically don't use electronics and require little to no training to use, low-cost, low-maintenance, and are commonly available. Mid-tech equipment only needs basic maintenance and can be operated electronically with little training. Commercially available and typically reasonably priced are mid-tech products. Complex electronics are used in high-tech devices, which typically have microprocessor components for data storage and retrieval. High-tech equipment is expensive, requires constant maintenance, and requires substantial training.

Along with acknowledging that "as the field evolves, there will be new issues that will further stretch our conceptions and compel new ways of categorizing and describing assistive technology." "Today's high-tech is tomorrow's low-tech" (Kumar, 2014). The students with visual impairment can employ a wide range of technological tools to improve their academic achievements, such as screen readers, Audible, tactile signs and warning surfaces, Braille translators, digital talking books, CD audio players, and many others. Any gadget used to improve performance may also need clinical knowledge to identify and track underlying health issues that limit functionality (Maureen & Opeyemi, 2022). Providing SWVI with AT training skills increases their self-esteem and helps them contribute positively to society. According to (Maureen & Opeyemi, 2022)

students with visual impairment can compete with other learners when they are taught how to use low to high levels of AT in their daily lives.

In my opinion, based on the study findings it was found out that magnifying glass and victor readers were most common used devices among students with low vision and Computers audio recorder was mostly used by students who are blind. The conditions of these devices were not in normal user conditions. However, this contradicts with the study findings by Ferrell (2017) who revealed that they are always many assistive technologies used by the students with visual impairment yet my findings show that the devices were few and the few that existed were not in normal condition for use. This implies that most of the students with visual impairment were using moderate versions with their related challenges.

2.2 The use of Assistive Technologies in the Education of Students with Visual Impairment in Secondary Schools

Uganda has taken affirmative action in favor of marginalized groups with the focus of persons with disabilities (Mathur et al., 2024). This effort has resulted into formulation of disabilities laws and policies that promote equality, inclusion, and participation of persons with disabilities in society. In September 2008, Uganda ratified the UN Convention on the Rights of Persons with Disabilities (CRPD) with Article 9 of the CRPD requiring all States Parties to take measures to ensure that facilities and services are accessible to persons with disabilities (De Heusch, 2023).

Also, the need for assistive technology accessibility is influenced by the nature and severity of the disability (Gregg & Colbert, 2013).The people who need

assistive technology will mostly include those with disabilities, older people, and those suffering from chronic or non-communicable disease (UNESCO, 2019). In this regard, studies indicate that with assistive technology, people with disabilities could enjoy productive and independent lives, thus reducing support services from society, long-term care, exclusion, and dependency on family members (UNESCO, 2019).

Similarly, access to assistive technology and instruction with assistive technology must be driven by individual needs, not by logistical constraints such as availability of equipment, location or model of service delivery, or funding restraint (Kelly, 2018). Currently, some SWVI have access to a wide range of assistive technology, while others have none at all (Kelly, 2018). While the SWVI have to rely on alternative format books, such as large print or Braille, as compared to their sighted counterparts, who access written text, the former are dependent on their teachers and peers to describe the matter to them (Kelly, 2018).

On the contrary, lack of knowledge about the challenges faced by students with visual impairment when adjusting to technology, can make it more difficult to offer assistance by the teachers (Smith & Kelly, 2019). Therefore, an effort should be made to offer structured training to benefit those who must use technology for a certain set of duties.

Likewise, the accessibility of assistive technology for students with visual impairment is frequently hampered by issues like location, cost, and manpower (Lan, 2019). The main challenges include finding the best information required for independent travel, displaying it in a non-visual format, such as auditory or

vibratory signals, manufacturing the devices at an affordable price, and finally instructing students with visual impairment to use these devices (WHO, 2016).

Referring to the structural adaptations for effective orientation and mobility of the students with visual impairment most of the schools in Uganda do not possess many of the prescribed infrastructural standards as specified by the 2006 Disability Act. There are still many gaps in the such as lack of door ramps, inadequate Braille books among others.

Additionally, lack of training in assistive technology frequently makes it more difficult for educational professionals to teach (Lan, 2019). Research has shown that while some students with visual impairment has access to teachers who are skilled in delivering specialized, others do not (Erin & McCall 2018).Therefore, to ensure that professionals stay current with developing technologies, there should be available opportunities for professional development (McKenna, B., et al., 2018).

According to Hersh., et al., (2018), the use of assistive technology takes into account users with various disabilities, from limited mobility to sensory and cognitive impairment, and their caregivers, the assistive technology technicians must all work together for an assistive technology device to be adopted. Braille sense is another illustration of assistive technology for those who are blind. The Braille Sense gadget can be thought of as a unique laptop that combines a screen reader with Braille displays to enable visually challenged individuals to access digital content and websites using both Braille and speech (Theofilou & Psillaki, 2024), claim that Braille Sense is a popular assistive technology for students with visual impairment. Additionally, due to its tiny size, Braille Sense allows students

with visual impairment to read and edit documents on a computer without the use of a Braille printer (Permana et al.,2024).

Additionally, smartphones have a range of features that explains the growing use of phones by students with visual impairment in their daily lives Smartphones that support non-visible input and output have enhanced students with visual impairment in dealing with their surroundings and accessing information. The development of assistive technology for students with visual impairment is being focused on mobile devices (Kim & Park, 2016).

Teachers may experience external influences on their proficiency with assistive technology, including their degree of technology training, ongoing professional development, and the availability of funding sources for AT (Cook & Polgar,2013). Stated majority of suggestions to improve competence centre on teacher training through the implementation of curricula in teacher preparation programs for instructors of students with visual impairment (Koehler & Mishra, 2008). The acceptance of technology by instructors, though, is probably influenced by a number of other factors. For instance, a teacher may only employ a particular assistive technology in the classroom if there is a student who could potentially benefit from it and if the teacher feels that the tool would support the student's learning more effectively than other (non-technology) instructional resources (Wang & Ertmer, 2020). As a result, the teacher of students with visual impairment becomes proficient and promotes the use of that particular assistive technology.

In the same way, there are several different ways that teachers of students with visual impairment educate, including as itinerants, in resource rooms, and at

residential schools (Wheeler, 2024). Some teachers who work students with visual impairment might combine any of these roles or offer services outside of the classroom, such as in homes. Teachers of students with visual impairment interact with school personnel, acquire access to the general curriculum, and deliver teaching relating to it (Yue-Ting & Valerie, 2014). To engage with students with visual impairment one-on-one, itinerant teachers move between different locations. Resource room teachers work with students with visual impairment all day long at a single school. The majority of the workforce at residential schools includes teachers who have expertise working with students with visual impairment. While resource room and itinerant teachers might or might not go to seminars for general education personnel, residential school staffs go to their professional development events (Yue-Ting & Valerie, 2014).

However, the case-loads of teachers who work with students with visual impairment might also change as a result of pupils graduating, moving to new schools, or being reallocated for administrative or logistical reasons (Davies, 2013). These teachers can't acquire training in all the AT that might be important to future students because their caseloads can change from year to year. As a result, they must possess both a solid understanding of assistive technology and continual professional development (Aria, 2013). Some students with visual impairment finds it difficult to adapt to the use of assistive technology due to previous experiences and psychological trauma and which sometimes takes a series of rehabilitation to put them back on track psychologically (Emeka & Dominic, 2019).

Both the teacher and the students with visual impairment appear to find some of these devices quite difficult to use, which sometimes annoys both parties. Equipment sharing between classes is a typical practice in many institutions, which limits the amount of time available to individual students (Cook & Polgar, 2013). The accessibility of electronics for accidental and useful use is also influenced by how each school stores and manages its equipment (Theofilou & Psillaki, 2024). Users and service providers alike are frequently frustrated by problems with equipment maintenance and repair (Haardt & de Almeida). Teachers note that when equipment malfunctions, students may be without their assistive technology for several months while it is sent back for repairs (Cook & Polgar, 2013). For teaching personnel, even routine upkeep of equipment that needs a steady power source can be disruptive and time-consuming.

The most often cited obstacles to the adoption of assistive technology were the expensive costs of such equipment and the lack of funding to cover these expenses. According to coordinators at Government Special Schools in IdoOsi, Ekiti State (Douglas, 2012), often schools report having access to less money than they need to support students' technological requirements because the gadgets are expensive. This implies that the students will only have a limited amount of exposure to various gadgets and that the availability of these devices for student usage depends on the funding allocated for their acquisition (Johnson, 2013).

In the labs of numerous secondary schools in Uganda, there are a few computers (Dakwa et al., 2014). As a result, not all students will use these laptops frequently in class. The interview revealed that many students only use the computer lab or room for classes twice a week which is insufficient for quality education. It's

critical to take good care of the hardware and software (Prentice et al., 2021). For computers to be functional, this necessitates the hiring of trained workers to do cleaning and maintenance. The need for professionals who can maintain AT while students utilize it should be filled. The assistive technology is currently only being used by teachers and students as consumers. For a functioning computer facility for students with visual impairment, who rely on tactile input, large print, and speech access, maintenance, is essential (Rosner & Perlman, 2018).

In my opinion, based on the study findings it was found out that most of the students were not using assistive technology to their full potential which was attributed by lack of necessary knowledge, skills, competences and the extent of exposure to these technologies. This is in agreement with the study by Smith & Kelly, (2019). Therefore, it can be agreed upon that despite of the technology changes and improvement most teachers have not been able to adjust to students' challenges which have created usage gaps and despising of assertive technology.

2.3 The Perceptions of Students with Visual Impairment Towards Using Assistive Technology in the Education

According to Zhang et al. (2020), a significant number of people with visual impairments believe that assistive technology is an essential tool for improving accessibility to educational materials and resources. They can access digital content, textbooks, and educational materials in formats that are specific to their requirements thanks to assistive technologies including screen readers, braille displays, and software for magnifying images (Hersh & Johnson, 2020). Similarly, assistive technology is seen by visually impaired students as a method

to become more independent in their academic endeavors (Rönnberg et al., 2019). With assistive technology, they can communicate more effectively, finish tasks, and access and interact with digital content without constantly needing sighted help.

Similar to this, a large number of visually impaired students claim that using assistive technology improves their academic performance and learning outcomes (Mason et al., 2018). They may participate in class discussions, do assignments, study alone, and interact with the course material more successfully thanks to assistive technology, which increases their academic achievement. According to Huenerfauth et al. (2016), when using assistive technology, students with visual impairments may feel inadequate or dependent. They could experience annoyance, animosity, or low self-esteem as a result of believing that assistive technology serves as a continual reminder of their impairment.

Teachers are also aware that assistive technology gives students with visual impairments access to a greater variety of educational resources and materials, which increases their learning opportunities (Jang et al., 2019). These students can interact with the course material, investigate multimedia materials, and carry out independent research thanks to assistive technology, which promotes active learning and knowledge acquisition. According to Alleven and Schmetzke (2018), educators who work with kids who are visually impaired have favorable opinions about assistive technology use, but they also voice reservations about its accessibility and availability. They emphasized the need for additional instruction and assistance in making efficient use of assistive technologies. In general, visually impaired students have positive opinions regarding assistive technology

being used in the classroom. They feel more independence and confident in their ability to complete academic tasks with the help of assistive technology (Leung and Yuen, 2017).

Similarly, a research by Jena et al. (2018) found that professors were generally supportive of students with visual impairments using assistive technology. They indicated satisfaction with the use of assistive technology, saying it let them access information and engage in class activities. They also said it improved the learning experience and gave all visually impaired students equal opportunities. Assistive technology helps teachers and students with visual impairments communicate and work together more effectively in the classroom (Hsieh et al., 2019). While students with visual impairments value the independence and autonomy it gives them in their study, teachers always believe it increases student engagement and participation.

Additionally, according to Dalal et al. (2019), a lot of educators believe that assistive technology can help students with visual impairments feel included and have equal access to education. These kids can engage with digital content, finish assignments with their peers, and fully participate in class activities thanks to assistive technologies including braille displays, screen readers, and magnification software. According to Lee et al. (2020), teachers view assistive technology as a tool to encourage students' independence and self-reliance in academic work. Students with visual impairments gain confidence and autonomy by becoming proficient with assistive technology, which helps them navigate the classroom, access information, and advocate for their needs.

In line with this, Debevc et al. (2016) claim that both educators and visually impaired students have favorable opinions about using assistive technology, including screen readers and software for magnification. While students with visual impairments feel empowered and confident in their capacity to learn and succeed, teachers think it has made the learning process more effective and efficient. The employment of assistive technology in the classroom is viewed favorably by SWVI and teachers. According to them, AT may contribute to better information access, higher learning engagement, and increased independence (Seok and DaCosta, 2019).

Conversely, inadequate instruction and assistance on assistive technology use may lead to unfavorable opinions among students with visual impairments (Griffiths et al., 2017). Students may find it difficult to use assistive technology effectively without enough support, which could cause them to feel frustrated, powerless, or disengaged from the learning process. On the other hand, Al-hadidi and Al-Khasawneh (2016) claim that opinions regarding the usage of assistive technology vary among teachers of students with visual impairments. While some educators think assistive technology could enhance student learning, others are worried about the impact on social interaction and the possibility of growing reliance on the technology. According to Signh et al. (2019), students who are visually impaired typically have favorable opinions about using assistive technology in their academic endeavors because it makes it easier for them to communicate with others, access information more quickly, and finish assignments on their own. Additionally, the assistive technology was tailored to each person's needs.

According to Nyoni (2011), general education teachers must have the requisite abilities and a favorable attitude toward the use of assistive technology in order to successfully and meaningfully help students with visual impairment in general education settings. Teachers should be trained in a range of strategies to assist students in integrating into their school, community, and professional settings. To reduce or eliminate learning deficits in certain subject areas among students with visual impairments, teachers should employ the most effective teaching techniques and materials (Bouck et al., 2018).

Similar to this, some students may have technical difficulties or restrictions when utilizing assistive technology, which can cause annoyance and unfavorable opinions (Mason et al., 2018). Students may be discouraged from completely utilizing assistive technology in their academic pursuits due to problems like software bugs, compatibility concerns, or challenges learning how to utilize it. When utilizing assistive technology, some students may run into technical difficulties or limits, which can cause annoyance and unfavorable opinions (Mason et al., 2018). Problems like software bugs, incompatibilities, or challenges learning how to use assistive technology can prevent students from utilizing these tools to the fullest extent possible in their academic pursuits (Sapp, 2010).

According to Alkahtani & Keetam (2013), a lack of knowledge and instructional resources causes teachers to continue to worry about how to integrate assistive technology into the standard curriculum. The concern always stems from a lack of understanding about instructional methodologies and how to modify the curriculum to meet the needs of students, two important aspects of academic

success for students with visual impairments (Tony, 2019). However, Smith et al. (2015) claim that students with visual impairments had unfavorable opinions about assistive technology use because some of them had technical issues with the device, such as finding it hard to learn how to use it efficiently, and felt stigmatized by the need to use specialized devices. However, Hatlen (2015) states that with proper training and support, these negative perceptions could be overcome and SWVI could ultimately benefit from the use of assistive technology.

In general, assistive technology is seen favorably by both teachers and visually impaired students since it improves the teaching and learning process and gives every student an equal chance to succeed. Additionally, teachers can foster a more welcoming and encouraging learning atmosphere that enables students with visual impairments to realize their full potential by integrating assistive technology into the classroom.

In my opinion, based on my study findings it was found out that most of the students largely had positive perceptions toward the use of assistive technology however, some findings suggest that some students with visual impairment had developed negative perceptions. The findings were in agreement with the study conducted by Huenerfauth et al., (2016). Therefore, most of the participants were struggling with adopting to assistive technology due to complications use that requires a lot of close assistance from the teachers.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter outlined the methodology that guided the study. It describes the research approach and design, the areas of study, the target population, the sample and sampling technique, the research methods and instruments, the data collection procedures, the data analysis process, and the ethical considerations that were made.

3.1 Research Approach

There are numerous approaches to conducting research, including mixed, qualitative, and quantitative approaches (Haardt & de Almeida, 2020). Assistive technology use in the education of students with visual impairment was investigated using a qualitative approach. A qualitative research strategy entails planning how to proceed to understand particular groups or phenomena in their natural environment (Theofilou & Psillaki, 2024). In this study, the qualitative technique was preferable since it allows the researcher to gather specific data from the participants in a casual environment. The two secondary schools of Angal and Parombo where students with visual impairment are enrolled in this situation served as the natural setting. Additionally, this method employs smaller sample quantities (Haardt& de Almeida, 2020).

3.2 Research Design

Research design is a blueprint that gives the researcher outlines and details of research procedures from the questions of the research problem to the data analysis (Bamweyana et al., 2020). The study adopted a case study design

because it offers means of investigating complex social units consisting of multiple variable of potential importance in understanding the phenomenon like the types and conditions of available assistive technologies, how it being utilized by students with visual impairment and the perceptions of students with visual impairment towards the use of assistive technology in Angal and Parombo secondary schools in Nebbi district.

3.3 The Study Area

The study was conducted in Angal and Parombo secondary schools in Nebbi district, West Nile sub-region, northern Uganda. These schools were chosen because they are among the eight government-aided secondary schools with the highest number of students with visual impairment and environmental accessibility supporting students with visual impairment (EO SNE NEBBI, 2023)

3.4 Target Population

The groups of people or participants who have a particular set of desirable qualities and who are pertinent to the research issue under consideration constitute the target population. In this study, the study population included: students with visual impairment and resource room teachers. These were categorized into students with visual impairment as participants while resource room teachers as key informant in this study. The target population was forty three (43) students with visual impairment were the study population and the students with visual impairment were particularly identified as potential participants because they are directly the beneficiaries of the assistive technology and eight (8) teachers incharge resource room in Angal and Parombo secondary schools were the key informants due to the fact that they spend a lot of time guiding students with visual impairment on the use of assistive technology.

3.5 Sample Size

A sample is a collection of individuals or things that are chosen as a representative in a research study from a wider population (Faber & Fonseca, 2014). For this study, eight (8) students with visual impairment made up the study sample. The sample comprises of eight (8) students with visual impairment and four (4) teachers totaling to twelve (12) participants which was kept small in order to avoid saturation. Therefore, the researcher believed that beyond as sample of 12 participants the responses would be repetitive. This was drawn from Angal and Parombo secondary schools for the reason that they are the only secondary schools with the highest number of students with visual impairment and have been receiving assistive technology from the MoES in the district for students with visual impairment. In addition, four (4) teachers were selected as key informant in these two secondary schools and were interviewed. The choice of this sample was informed by (Rosner & Perlman, 2018) argument that a case study should only have a small number of participants so that the researcher may get as much specific data as possible from each one.

Table 3. 1: Sample of Participants

N/S	Type of participants	Number of participants	Sampling technique
1.	SWVI	08	Purposive sampling technique
2.	Incharge resource room	04	Purposive sampling technique
Total participants		12	

Source: Primary Data 2023

3.6 Sampling Procedure

According to Bodnar et al., (2013), sampling is the technique of choosing a representative segment of a population to establish the characteristics of the entire population. Purposive sampling was utilized to choose students with visual impairment as participants. The technique was used because the researcher believed in his opinion that they were likely to provide information relevant for the research problem. Criterion sampling was used for the case of this study. This was because it is a non-probability style of sampling in which the units are chosen such as individuals, groups, documents, and objects, based on how well the research problem and phenomena are understood (Sen, 2024). This study preferred this sampling method because it aims to choose participants based on specific criteria.

There were two criterion in selecting the students with visual impairment, the students who had either low vision or totally blind and were in S3 to S6 years of studies for the reason that they might have interacted with the assistive technology for longer time while in schools and therefore, have more information about the use of assistive technology. The resource room teachers as key informants in this study were selected based on the fact that they are managing resource room, transcribing work, training students with visual impairment in assistive technologies use because they are responsible for guiding students with visual impairment on how to effectively utilize the assistive technologies and they were also those who had taken at least two years working in the resource rooms.

3.7 Methods of Data Collection

Several data collection methods can be used in a qualitative research methodology. These include focus group discussions, archival records and

artifacts, observation, document analysis, and interviews (Permana et al., 2024). Based on the nature of this study, the researcher employed observation and interviews guide to collect date from the participants. These two instruments were used to gather the information provided.

3.7.1 Interview

According to Talapko et al., (2019) an interview is an interaction between the researcher and participants in terms of questions and answers and responses are recorded. There are three categories of interviews: Unstructured interview, this is a conversational interview, and the questions are driven by the circumstances. Structured interview has been carefully prepared and arranged to obtain precise information from the participants. Semi-structured interview is an area where questions are prepared, but the interviewer may add several questions that were not prepared during the interview process.

In this study, the researcher used a semi-structured interviews guide to get information on the assistive technology use in the education of students with visual impairment in secondary due to its independence and adaptability to change questions immediately, review, and expand the interviewee's responses throughout data collection. The interview took approximately 25-40 minutes on each participant as the interviewer was using a recorder to capture the voices and taking notes.

3.7.2 Observation

Observation is a specific method of acquiring unrestricted, first-hand knowledge by critically study in details people and places at a research location (Sen, 2024).

However, he asserts that to describe the context, the behaviors, and the interactions, qualitative observations rely on narrative or language. In this study, the researchers used an observation guide as a data collection instrument, because it allowed the researcher to gather information directly from the natural environment and confirm as well as non-verbal expression. The researcher also used observation to obtain information on how effectively students with visual impairment were using the assistive technologies in the classroom setting during the learning process. Besides, the researcher observed the nature of the assistive technologies in the resource rooms thus, the types available, and its condition.

3.8 Pilot Study

A pilot study is a small survey that is carried out to assist in recruiting participants, pretesting and retesting the study processes or methods, and validating the study materials (Sen, 2024). A pilot study was conducted in another secondary school in Nebbi district which provides a learning environment comparable to the study schools. This was done because of the following reasons; to pre-test my data-gathering instruments to find any potential flaws so that they may be fixed in a way that will allow me to collect accurate data for the study; to identify questions which are repeating, questions that could lead to vague responses and whether the questions are targeting the right participants. An appropriate revision to questions in the tools was done through re-framing some of the questions to target the right participants in order to give accurate results and also to enable me to obtain valid and reliable data for the main study thus, the question "How do your perceptions towards the use of AT affects your learning?" reframed as "Would you love to continue using AT devices in your education or it's an additional burden in your life?"

3.9 Data Collection Procedure

After the approval of the research proposal by the supervisors and the Department of Special Needs Studies at Kyambogo University, the researcher obtained permission from the head of the department to conduct the study. After being granted permission, the researcher formulated a request letter addressed to the participants and there after visited the proposed study location to meet the soon-to-be participants. The researcher then pursued consent from the school administration to be allowed to meet and established rapport with the probable participants to present the expectations, seek informed consent, and also get the expectations of the participants. On agreement between the researcher and the participants, an interview date was arranged and an interview conducted with each participant. During the interview, the conversation were audio-recorded, and the researcher took note for better record keeping, to help me use verbatim statements from the participants to maintain the originality of the information collected, to save time for the researcher and the participants and also to get first hand responses from the participants. The researcher observed the nature and the conditions of the assistive devices in the resource rooms, teachers and learners' behaviors during the usage of assistive technology in the class and class organization and arrangement and sitting position of students with visual impairment in the class and confirming the narratives from the participants during the interviews.

3.10 Data Analysis and Presentation

Data analysis is the process of revealing and comprehending the gathered raw data to derive its meaning and outline (Gao & Jacobson, 2016). When the process

of data collection was over, raw data were transcribed from audio format to text format and were checked and subjected to inductive thematic data analysis to build patterns, categories, and themes based on the objectives/questions. Common themes were identified by searching for keywords or phrases and grouping them into categories and sub-categories.

In reporting the information collected, some direct quotations and verbal responses from participants were used as recorded. The researcher also made comments on the response from participants which were backed up by literature reviewed in chapter two while codes such as SWVI1, SWVI2 and TR1, TR2 were used to protect the identity of participants where direct quotations from the participants were applied

3.11 Ethical Issues

The protection of study participants' right, the development of their sense of reliability, and the advancement of research integrity are all aided by ethical considerations (Emong, 2014). Research ethical considerations has been adhered to during the research study to maintain credibility and authenticity, paying special attention to consent and information confidentiality to safeguard participants' reputations.

To uphold these ethics, participants were informed of the study objectives, duration, and intended use. To avoid violating their rights, informed consent from the participants has been obtained by a written communication asking them to provide the information required for the study, including permission to record their opinions. To safeguard the participants, anonymity was maintained by employing codes throughout the data analysis. According to the idea of

anonymity in research, no identifiable information about participants should ever be made public (Sen, 2024). The ideas in this study has been presented in the researcher's own words; however, an appropriate acknowledgment has been made where ideas from other sources were being used.

3.12 Rigor and Trustworthiness

Rigor refers to the meticulousness, consistency and transparency of the research. It is the application of systematic, disciplined and stringent methods to ensure the credibility, dependability, confirmability and transferability of research finding (Long & Johnson, 2000). The researcher took different steps in ensuring that the findings were not biased: for credibility the researcher ensured a prolonged engagement with the selected participants by spending enough time between 25-40 minutes of discussion in order to build rapport and understand their experiences deeply on the use of assistive technology. For transferability, the researcher adopted purposive sampling technique in selecting participants and contexts that reflected the diversity and richness of the phenomena under study and this was done during pilot survey at Pakwach Secondary School. Dependability the researcher recorded the participants views to ensure originality of the data being collected to check for consistency in their analysis. Furthermore, confirmability was ensured through reflection on knowledge and acknowledging the potential biases, preconceptions, and influence of the participants during the interview process.

3.13 Limitations and Delimitations

In carrying out this study, there were limitations met by the researcher;

This study was carried out in Nebbi district and limited to only Angal and Parombo secondary schools which were selected due to their uniqueness of having the highest number of students with visual impairment, whose conditions may not necessarily be similar to other Secondary Schools all over the country. To overcome 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.

High expectations from the participants that resulted into unwillingness of some participants to participate in the study. Some participants expected incentives in terms of cash payments and refreshments which was expensive to the researcher. The researcher solved this by explaining to them that the study was only for academic purposes.

Having analyzed how the study was conducted, the next chapter focused on the data presentation, analysis and discussion.

CHAPTER FOUR

PRESENTATION, INTERPRETATION AND DISCUSSION OF FINDINGS

4.0 Introduction

This chapter presented the findings of the study. It included demographic characteristics of the participants and the key informants. It also presented the key findings on the use of Assistive Technology in the education of students with visual impairment in secondary schools in Nebbi district based on the following study objectives.

- To establish the types and conditions of assistive technology in the secondary schools in the Nebbi district.
- To investigate how Assistive Technology is being used in the education of Students with visual impairment effectively in secondary schools in the Nebbi district.
- To explore the perception of students with visual impairment towards the use of assistive technology in the secondary schools in the Nebbi district

When presenting data, verbatim statements from the participants were used to maintain the originality of the information collected. Each section begins with the presentation of the findings, followed by the discussion of the findings according to the literature reviewed. The codes SWVI and TR have been used 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.

4.1. Description of Participants

The study targeted students with visual impairment and resource rooms teachers in Angal and Parombo Secondary Schools in Nebbi district. The total sample size of participants was 12 comprising of 8 students with visual impairment and 4 resource room teachers. All the participants were reached and interviewed.

Table 4. 1: Demographic characteristics of participants

Category	Gender		Total
	Male	Female	
SWVI	5	3	8
Teachers	2	2	4
Total	7	5	12

Source: Primary Data 2023

4.1.1 Secondary Schools

The study was interested in two secondary schools with the highest number of students with visual impairment and are using assistive technology during learning process of students with visual impairment. The schools' characteristics are presented as below;

- SSCH 1: it was Angal secondary school with 8 Students with visual impairment
- SSCH 2: it was Parombo secondary school with 6 Students with visual impairment

4.1.2 Students with Visual Impairment

The study involved five students with low vision condition and three totally blind students who shared their experience in using assistive technologies during learning process. These students were selected from S3 to S6. The student's characteristics are presented as below;

SWVI1: He is male with low vision from SSCH 1, S3

SWVI2: She is female with low vision from SSCH 1, S5

SWVI3: He is male with total blindness from SSCH1, S4

SWVI4: He is male with total blindness from SSCH 1, S3

SWVI5: He is male with low vision from SSCH 2, S4

SWVI6: She is female with total blindness from SSCH 2, S3

SWVI7: He is male with low vision from SSCH 2, S5

SWVI8: She is female with low vision from SSCH 2, S6

4.1.3 Resource Room Teachers

This study was interested in the teachers who had spent at least 3 years interacting with students with visual impairment in the resource rooms. The individual characteristics are presented below;

TR1: He is male with Bachelor of Education with eight years teaching experience in this school, five years working in the assistive technologies resource rooms from SSCH 1

TR2: She is female with diploma in Education secondary, with ten years teaching experience in this school, three years working in the assistive technologies resource rooms from SSCH 1

TR3: He is male with Bachelor of Education with four years teaching experience in this school, three years working in the assistive technologies resource rooms from SSCH 2

TR4: She is female with Bachelor of Education with six years teaching experience in this school, four years working in the assistive technologies resource rooms from SSCH 2

4.2 The Types and Conditions of Assistive Technologies in Secondary Schools

4.2.1 The Different Types of Assistive Technologies Available in the Schools for Students with Visual Impairment

Participants were asked the types of assistive technologies available in the school for students with visual impairment to learn effectively, the low-tech assistive technology were mentioned by the participants as below.

> The assistive technology I have been using for long in this school are magnifying glass, talking calculators (SWVI 8).

> I can also remember we have audio recorder which we use for recording lesson (SWVI 2)

> Students with visual impairment have been struggling due to limited Assistive technology we have for them in the school, but the few I can

> remember are the phones with memory cards, talking calculator but they are few in numbers (TR 4).

From the above statements, talking calculator indeed part of the assistive technologies that offer an opportunity for students with visual impairment to learn.

There is also an indication that they are comfortable to use by students with visual impairment. Never the less, there is a sign that these are the only low-tech available for the students with visual impairment in these two schools out of many of the available.

It's also emerged from the data that there are some devices such as simple phones are being used by students with visual impairment to record work on memory cards for future use.

> We have some simple devices we use such as talking calculators and simple phones we use to record and read work (SWVI 5)

When an observation was made on the resource room, the researcher found out that the assistive technology resource room had only five talking calculators in each school, three memory cards with simple phones in each school, and two talking calculators only in one school, This information corresponds with the narratives of the participants given above. This suggests that little effort is being put in place to avail assistive technology to students with visual impairment much as there are varieties of low-tech which students with visual impairment could use during their learning process.

This is in line with Fernandez-Cisneros et al., (2024) assert that low-tech often don't use electronics and are simple to use. Examples are pencil grips, highlighter tape or pens, and modified furniture, which are generally accessible, inexpensive, and low-maintenance.

Additionally, Allman & Lewis (2014), indicated that visual impairment is variable in type, levels, and time of onset, even the kind of assistive technology they require may differ accordingly therefore, there is needs for a variety of assistive technologies.

From the expressions of the participants, it was also stated that these schools have some high-tech such as computers, CCTVs, clear reader, victor reader, and Braille embosser.

> The devices we have is a victor reader which is used for recording and they are easy to use and it is clearer than the ordinary audio recorders (SWVI 7).

> We also have CCTVs and screen readers which we used for our easy reading (SWVI 4).

> We have a victor reader, some computers installed with JAWS for them to use, CCTVs for reading large print, (TR 1).

The above statements reveal that students with visual impairment in these schools have access to some of the High-tech such as computer installed with JAWS, victor reader and CCTVs.

On the same note, while observing the assistive technology resource rooms, it was discovered that there are some computer laptops installed, a victor reader, and CCTVs which some of the students could use though they were inadequate in number. This information is in line with the above statements from the participants.

These findings suggest that there are some high-tech available in these schools to aid learning of students with visual impairment. There is also evidence that an effort is being made towards using them by students with visual impairment.

According to CDT theory, it echoed well that "valuing diversity," which in this case means SWVI has diverse needs and has to interact with the different types of AT devices in their school, ranging from low-tech to high-tech, to enhance their full participation and engagement in the education without any discrimination. However this has been found not possible in these two secondary schools given the situation described in the above findings making it contradictory to the CDT theory which advocates for variety and availability of assistive technologies due to diversity of visual impairment, therefore with only a few assistive technology in these two secondary schools, their engagement and participation in the learning process is limited.

This is in line with Boucher (2018), who asserts that Several assistive technologies are available to support the students with visual impairment in their education such as televisions, computers, the internet, telephones, and Smartphone.

This is in agreement with Rosner& Perlman (2018) identifies screen readers which convert electronic text into speech; screen magnifiers 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; scanners for converting images from print material to computer file which can be converted into other accessible formats, computers associated with adapted software, CCTVs, clear readers, Power Point projectors, Smartphones, mobile telephone software like Google assistant, the loop, zoom text, and Optical Character Recognition software (OCR) among others.; as high-tech compatible with students with visual impairment.

This is in agreement Ferrell (2017) reveals that students with visual impairment require screen readers and screen magnifiers, speech, text, and Braille conversion technology, a computer installed with screen reading software, a digital tape recorder, a Braille note taker, a Braille embosser, a refresh-able Braille display, word processors, a talking dictionary, a talking watch, and screen reader software to access education.

Whereas there is a similarity in the assistive technology in these two Secondary Schools, they are just few compared to the variety of assistive technology highlighted by the above studies. This indicates that the level of interaction of students with visual impairment with assistive technology is minimal since they do not have a variety of assistive technology to choose from during learning process.

4.2.2 The Conditions of the Assistive Technologies in the Schools

Participants were asked to describe the conditions of the assistive technology available in the schools. Many ideas came up and they have been analyzed and presented as below:

> Our resource room has few assistive technologies and some of them are not even in the working condition (SWVI 1).

> Some of these devices available in the resource room are not being exposed to us especially computer it's only the sighted learners are benefiting from (SWVI 6).

> This device available in the resource room has now taken two years without maintenance and even the number of SWVI has overwhelmed the number of the devices we have here (TR3).

The findings provide that some of the assistive technologies in these schools are not in working conditions in addition to being limited in number. This is attributed to some of the devices which needs repair.

From the observation of the resource room there was confirmation of the narratives of the participants because there were some few victor readers, CCTVs, talking calculators and laptops with JAWS in each of the two secondary schools visited which were not even in good working conditions.

The above findings indicate that students with visual impairment in these two secondary schools are not effectively using assistive technologies during their

learning process. This could be attributed to factors like inadequate number of devices in working conditions.

According to CDT theory, the absence of access to the necessary assistive technology, enable people with disabilities experience social injustice, marginalization, and discrimination. Therefore, integrating all different types of devices in working conditions while adapting to their functional needs enable students with visual impairment participate well in the learning process.

This is in agreement with Wheeler (2024) argued that students with visual impairment can employ a wide range of technological tools to improve their academic achievements, such as screen readers, Audible, tactile signs and warning surfaces, Braille translators, digital talking books, CD audio players, and many others. However, Assie (2021) affirmed the above findings that there is scarce of assistive technologies for users who are loco-motor, visual, and hearing challenged and reveals that many libraries lacked functional assistive technologies to cater to the needs of students with visual impairment.

4.3 How Assistive Technology is Being used in the Education of Students with Visual Impairment Effectively

4.3.1 The Assistive Technology Students with Visual Impairment Use Effectively During Learning Process

Participants were asked the types of assistive technologies they can use effectively; many ideas came up and they have been analyzed and presented as below:

> We also use a clear reader to scan and read, a victor reader, to convert word documents into audio, computers with JAWS and CCTVs, (SWVI 3).

> I use a clear reader to scan the work and it easy to use (SWVI 4).

> With the help of headsets, I listen to the notes being read for me by victor reader easily, (SWVI 6).

> CCTVs have enabled our blind students read without much problem and it has enabled them to learn effectively than before (TR 2).

These statements suggest that using assistive technologies has greatly enabled SWVI to easily read and learn effectively. CCTVs, clear reader and victor reader have become very convenient to read information and also improved the performance of some students with visual impairment in the recent years.

There are those participants who revealed that they use assistive technologies specifically to magnify print information both diagrams and text. They explained that a CCTV has been of great use for this particular activity.

> I have been using a CCTV to enlarge the print so that I can read and revise my notes, (SWVI 5).

The findings indicate that whereas the assistive technologies are inadequate in the schools, with the help of CCTV, students with visual impairment especially the low vision, can use their remaining vision to have control in accessing information in text format. This means that they have a leveled ground towards

access to the curriculum content during the teaching/ learning process just like their peers without visual impairment.

There were other participants who stated they use assistive technologies especially the computers effectively during learning to type and save notes.

> Some of us use computers to type work and save them for later use. (SWVI 6)

> I always get the notes in soft copy with the help of a laptop. (SWVI 4)

The statements indicate that some of the students with visual impairment have attained skills in using a computer to support them during the learning process. This should be encouraged as it enables them to have information in multiple accessible formats but those knowledgeable are still very few in number due to limited practice time they get.

It also emerged that students with visual impairment at times do record lessons or notes using assistive technology gadgets such as simple phones and memory cards. They elaborated that the recordings are later played for revision purposes.

> Some of our blind students use simple phones to record lessons and playing them later for revision, (TR 3).

From the findings, there is a suggestion that recording lessons would be one of the modest ways to access their learning materials in audio format. However, the school does not have a variety and enough recording assistive technology gadgets, leaving students with visual impairment to improvise using their simple phones with memory cards. The Secondary Schools seem to put more effort to

have students with visual impairment have access to appropriate recording assistive technologies.

The findings, therefore demonstrate that even with the limited assistive technologies in these schools, students with visual impairment have got a leveled ground towards access to curriculum content during the teaching process.

In the CDT, understanding the setting in which assistive technologies are used, there is a need to consider accessibility. This is crucial because with variety and accessible assistive technology, students with visual impairment will gain much knowledgeable and skilled in the use of assistive technology for effective teaching and learning which for this study some of the students with visual impairment are able to effectively use these devices well in their learning.

This is in agreement with UNESCO (2019) asserts that the need for assistive technologies accessibility is influenced by the nature and severity of the disability. In this regard, people with disabilities could enjoy productive and independent lives, thus reducing support services from society, long-term care, exclusion, and dependency on family members if they can effectively use assistive technologies to aid their functioning in the society.

This is in agreement with the study conducted by Kelly (2018) urges that access to assistive technologies and use of assistive technologies during instruction by students with visual impairment must be driven by individual needs, not by logistical constraints such as availability of equipment, location or model of service delivery, or funding restraints. He further states that currently, some students with visual impairment has access to a wide range of assistive

technologies and are using them effectively, while others have no knowledge at all.

4.3.2 Challenges Faced by Students with Visual Impairment Regarding the use of Assistive Technologies in their Learning

Participants were asked to identify challenges students with visual impairment face regarding the use of assistive technologies in their learning. A lot of issues emerged and have been analyzed and presented as below:

From the expressions of the participants, it was revealed that students with visual impairment do not have adequate training in using assistive technologies.

> Some of the challenges I constantly face is that some of the assistive technologies are complicated which needs guidance from our teachers, unfortunately even some of my teachers are not in position to guide me well on the usage of the equipment (SWVI 3).

> The challenge we experience with the use of assistive technology is most of us are not well versed with these devices since in our primary schools we were not having access to them and yet even some of our teachers here cannot even use some of the devices (SWVI8)

> We Suffered when our madam incharge resource room was for maternity leaves and the co-teacher in resource was sick none of other teachers can take us through to help in the training, (SWVI 4).

> The challenge we have is that most of us much as we work here in the resource room, we have limited skills and knowledge in using some of

these devices and yet we have to train these students with specific skills in using them (TR 3)

The findings reveal that due to the lack of adequate training in the usage of assistive technology, teachers find it difficult to guide students with visual impairment to use assistive technologies effectively during teaching. It is also true that students with visual impairment cannot use assistive technologies effectively in their learning due to the fact that it is technical and requires specialized training. This warrant the aspect for effective use of assistive technologies during the teaching/ learning process.

This is in agreement with Lan (2019) said lack of training in assistive technology frequently makes it more difficult for educational professionals to teach. Therefore, to ensure that professionals stay current with developing technologies, opportunities for professional development should be available (Shu& Zhou, 2018).

Undoubtedly, inadequate training has been highlighted as one of the biggest challenges in enabling students with visual impairment to use the assistive technologies effectively in order to attain required knowledge and skills and gain confidence and competence to ably learn curricula activities in Secondary Schools. It is obvious that without this, their effort to learn is greatly affected.

Participants also attributed the challenge to accessibility because you may want to use the assistive technologies but they cannot be accessible especially when the teachers incharge the resource room are absent.

> Besides, those assistive technologies in the Resource room are few compared to our numbers, like CCTV has to be used by one person at a time (SWVI 7).

The above statements indicate that whereas the school has some of the appropriate assistive technologies, students with visual impairment have limited time to interact with the assistive technologies due to their limited number compared to the number of students with visual impairment.

This is in line with Smith & Kelly (2019) who assert that lack of knowledge about the challenges faced by students with visual impairment when adjusting to technology, can make it more difficult to offer assistance.

Participants did point out that there are inadequate assistive technologies in the school, something that limits them from fully making use of assistive technologies during the learning process.

> The AT devices are not enough to all of us. The Resource room has few of these devices and it is hard for us to access them for during the learning (SWVI 6).

> Being in different classes, when you want to use you find other classes are already using them sometimes, we end up missing lessons because you have no devices to use (SWVI2).

These findings suggest that whereas students with visual impairment are not properly equipped with knowledge and skills, the situation has been made worse

with inadequate assistive technologies and those who get a chance to access them may not be given enough time to practice the usage.

This is in line with Douglas (2012), who reveals that most often schools report having access to less money than they need to support students' technological requirements because the gadgets are expensive. This implies that the students will only have a limited amount of exposure to various gadgets.

Furthermore, it was supported by the study Luyombya (2013) asserts that in the labs of numerous secondary schools in Uganda, there are a few computers. He further revealed that many students only use the computer lab or resource room for classes twice a week which is insufficient for quality education. This shows that AT devices that are most likely to facilitate learning are either not available or not accessible thus, not all students with visual impairment can get access to assistive technologies during the learning process.

From the data, participants reported that lack of reliable electricity supply in the school possess a challenge towards the effective use of assistive technologies by students with visual impairment during the learning process. This was confirmed by the following statements:

> The power is on and off and sometimes when it is your turn to learn and power has gone, you have to wait for another time (SWVI 1)

> There is also a problem of WENRICO supply because any time it goes off and since we are not connected to the national grids, power is our major problem; also, our generator is always without fuel (TR 3).

The findings presented above suggest that the use of assistive technologies for the learning of students with visual impairment has been greatly disrupted by the inconsistent power supply. However, in this case these schools do not have a stable power supply and this makes it hard to operate assistive technologies like computers which require constant power.

This is in line with Smith& Kelly (2019) who indicate that power interruptions were ranked among the causes of the low level of assistive technology use in schools and explain that electricity failure was a persistent problem against the use of assistive technologies. Most of the assistive technologies especially the high-tech are heavily dependent electricity supply and therefore, any shortage disrupts their use.

In support of the above, González-Martínez et al., (2019) observe that the availability of electrical devices is one of the important factors related to electronics; thus, sufficient power supply is required so that a lesson where assistive technologies are being used can be conducted.

The CDT asserts that PWD suffer from disadvantages due to the environment's inadequate response to their variety of needs. According to a bottom-up view, the performance gaps already present in the diversity of disabilities can only be filled by assistive technologies to support and provide context for the supply of assistive technologies to students with visual impairment in secondary schools.

4.3.3 How to Overcome the Challenges Students with Visual Impairment Face while Using Assistive Technologies During Learning Process

Participants were asked how the challenges identified above can be overcome, many ideas came up and they have been analyzed and presented as below:

The participants stated that Secondary Schools teachers urgently need in-service training on using the assistive technologies for students with visual impairment so that they can ably guide them well and their responses are as stated below: -

> I think our teachers need to be train in the use those assistive technologies especially computers (SWVI 7)

> I request the MoES to organize training for teachers since in our training as teachers we did not have any dose on use of assistive technologies (TR 2).

The findings indicate that both teachers and students proposed that teachers in Secondary Schools should be given opportunities to undergo training on how to use various assistive technologies through in-service training.

This is in lined with Cook & Polgar (2013) who stated that majority of teachers may experience external influences on their proficiency with assistive technologies, including their degree of technology training and ongoing professional development. Therefore, there is a need for teachers to undergo continuous professional development in any new innovation in place.

In agreement McKenzie (2017) reveals that the acceptance of technology by teachers, is probably influenced by a number of other factors such as the expertise

of the teachers as a result, the teachers of students with visual impairment becomes proficient and promotes the use of that particular assistive technologies. Similarly, Bandung et al., (2016) also observe that the professional development of teachers in assistive technologies use for the entire school teaching staff is very critical. The teacher preparation should be dedicated to not only developing assistive technologies skills in teachers but also how to adapt assistive technologies and use them to benefit students with visual impairment in secondary schools. In a divergent view, Aria (2013) states that, teachers can't acquire training in all the assistive technologies that might be important for the students in future because their caseloads can change from year to year. As a result, they must possess both a solid understanding of assistive technologies and continual professional development

> Since my school is a government school, the headteacher should request the MoES to give us more assistive technologies (SWVI 5)

> The assistive technology should be made enough for us so that we can practice in our free time (SWVI 1).

Following the above findings, there is an indication that secondary schools are in urgent need of well-equipped assistive technologies, especially for students with visual impairment. The findings also show that there is an urgent need for MoES to prioritize equipping assistive technologies to secondary schools with students with visual impairment. The assistive technologies have to be accessible to give time for students with visual impairment practice and make use of them for learning purposes.

This suggestion corresponds with WHO (2016) who recommends that schools should be equipped with modern assistive technologies which are less bulky, easier, quick and motivating as it encourages independence in learning. Stocking of assistive technologies facilities in Secondary Schools with appropriate equipment will enable the students with visual impairment to have access to assistive technologies devices and time to practice.

Data also show that provision of adequate support to students with visual impairment, Accessibility, provision of variety of assistive technologies be put in place for students with visual impairment.

> We need to always be supported in order for us effectively use the available assistive technologies to learn effectively (SWVI 6).

> Much as these devices are there in the resource room, making it accessible for us will enable us constantly practice the use (SWVI 2).

> We need more especially DAISY reader I have just heard about it but I have neither seen nor use (SWVI 5).

In the same vein, Theofilou & Psillaki (2024) reveals that when providing adequate AT support that students with visual impairment can use comfortably, it's critical to take into account their unique preferences for various types of technology

Similarly, Wang et al., (2016) argues that the use of and access to assistive technologies, however, is challenging for students with visual impairment due to many barriers, including insufficient teacher preparation, difficulty in getting

students to access the assistive technologies they need, cost, environmental barriers, cultural barriers, and regulatory barriers

Some participants suggested that the school can collaborate with other schools with similar students so that they can borrow good practices in using assistive technologies from their colleagues.

> Other schools have some assistive technologies which we do not have here like DAISY reader, our teachers could contact them to borrow for us (SWVI 4).

This finding reveals that when teachers collaborate with their colleagues that enroll students with visual impairment, they can learn from each another, exchange ideas on how to help these learners. It's true that if a school does not have certain AT equipment, it is possible to obtain such from a sister school.

Additionally, Johnson (2013) Also suggest that supporting partnerships among teachers that help teachers share assistive technologies 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 assistive technologies. The students with visual impairment should thus be provided with opportunities by their teachers to visit other similar schools as a way of expanding their knowledge on the usage of assistive technologies in secondary schools.

According to CDT if the teachers and students with visual impairment have access to adequate and appropriate assistive technologies facilities, the use of

assistive technologies in their education is likely to be achieved in a mainstream setting.

4.4 The Perception of Students with Visual Impairment Towards the use of Assistive Technology During the Learning Process

Participants were asked how they feel about using assistive technologies during the teaching/learning process, many ideas came up and they have been analyzed and presented as below:

> I find them useful in my study as it gives me equal opportunity to learn with others and participate in classroom activities, (SWVI 1).

> I love to use these devices as its helpful to in accessing information and participate in classroom activities, (SWVI 8).

> Its complementary to my low vision as with help of JAWS I can effectively read my notes which were not easy before, (SWVI 4). Yes, I can read, with the help of magnifier (SWVI6)

> At first, I thought these AT devices are expensive but to my surprise we can even make our students to use simple phones with memory cards to record lessons (TR 3)

> At first, I hated myself especially when I was in primary school as we were being forced to learn Braille yet I can use my small vision to see but with the help of this magnifiers it has made my life comfortable in the class, (SWV 6)

> I am comfortable guiding my students to use AT devices in their education due to the fact that these devices are expanding the learning opportunities for students with visual impairment and making them gain confidence (TR 1).

The above findings indicate that majority of students with visual impairment and their teachers have positive attitudes towards the use of assistive technologies in the education. This kind of attitude could be attributed due to the benefit which students with visual impairment are enjoying from assistive technologies in their education.

This is in line with Zhang et al., (2020) who assert that many individuals with visual impairment perceive assistive technology as a crucial tool for increasing accessibility to educational materials and resources. In agreement, Hersh & Johnson (2020) assert that assistive technologies such as screen readers, magnification software, and braille displays enable them to access digital content, textbooks, and instructional materials in formats tailored to their needs. In the same way, Rönnberg et al., (2019) argue that students with visual impairment perceive assistive technology as a means to increase their independence in academic pursuits.

Correspondingly, Leung and Yuen (2017) emphasize that students with visual impairment are generally positive about the use of assistive technologies in the classroom as they feel more independence and confident in their ability to complete academic tasks with the help of assistive technologies.

Equally, Jang et al., (2019) affirm that most teachers also have positive attitude towards the use of assistive technologies as they recognize that assistive technologies as a tool expands learning opportunities for students with visual impairment by providing access to a wide range of educational materials and resources. Similarly, Alleven and Schmetzke (2018), state that teachers of students with visual impairment have positive attitudes towards the use of assistive technologies, but also express concerns about the availability and accessibility of these tools. They highlighted the needs for more training and support in using assistive technologies effectively.

Data also show that some participants had negative feelings towards the use of assistive technologies in their education.

> Sometimes I don't really want to use these devices especially magnifier as people can identify me easily that I am blind, (SWVI 3)

> Some of the devices are good but for me to carry Perkins braille all the time going to class is an additional burden to me on top of me not seeing (SWVI 7)

> They have brought white cane for me to use but people see me from a far and they start labeling me that see the blind lady yet I can use my small vision to move within the school. (SWVI 5)

> I love to use these devices but some of them are too complicated to operate especially computer with JAWS unfortunately even some of our teachers cannot operate them it has made me to hate them. (SWVI 3)

> My headteacher always say SWVI are expensive to manage since their devices are also expensive this make some of our staff not to support them to use their devices effectively as they concentrate on other learners (TR4).

The above findings indicate that whereas the use of assistive technologies devices in the education of students with visual impairment is inevitable, negative attitude from the users and those who are in charge may make it difficult to utilize these devices for the benefit of students with visual impairment. This kind of attitude could be attributed due to lack of appropriate awareness about the education of students with visual impairment.

In agreement, Alkahtani & Keetam (2013) argue that some teachers have teachers still have negative attitudes towards the use of assistive technologies as they worry about how to include assistive technologies in the regular curriculum due to a lack of information and pedagogical tools. The fear always come as a result limited knowledge bout instructional strategy and how to tailor the curriculum to students' requirements, which are crucial elements of students with visual impairments' academic achievement (Tony, 2019).

In the same line, Smith et al., (2015) declare that some students with visual impairment had negative perceptions towards the use of assistive technologies as some of the students with visual impairment experience technical difficulties with the technology such as difficult to learn how to use it effectively, and feels stigmatized by having to use specialized devices. However, Hatlen (2015) states that with proper training and support, these negative perceptions could be

overcome and SWVI could ultimately benefit from the use of assistive technologies.

Additionally, Al-hadidi and Al-Khasawneh (2016), argues that teachers of students with visual impairment have some mixed attitudes towards the use of assistive technologies. While some teachers believe that assistive technologies could help improve learning outcomes others are concern about the potential for increased reliance on the assistive technologies and the impact on social interactions.

The CDT is very clear on the impact of the perception of students with visual impairment and their teachers. The negative attitude towards students with visual impairment is a burden, and therefore leads to the marginalization, discrimination, and social injustice of such individuals. In this case, the CDT is essential for comprehending perceptions and their implications in an area of social-cultural context, including attitudes of teachers and students with visual impairment towards the use of assistive technologies, which the study finds contrary as some of the teachers and the headteachers have negative attitudes towards this learners and students with visual impairment themselves have negative attitudes towards the use of some of the assistive technologies which had always led to their insufficient use of assistive technologies effectively in their education.

Participants were also asked whether they would love to continue with using assistive technologies in their education or it's an additional burden in their life, many ideas came up and they have been analyzed and presented as below:

> Not really, without AT devices I cannot survive especially my Perkins braille it's my everything to learn (SWVI 4)
>
> I want to use them everywhere as it's so helpful for me without it I feel there's one part of my body missing especially clear reader (SWVI 2)
>
> By the way I have seen my colleague performing well last year in UCE with the help of these devices how can I leave it (SWVI 8)
>
> Why not this has become part of me. It's my second teacher so long as I am in school, by the way even at home I cannot do without them especially my smartphone (SWVI 5)

The above findings indicate that most of students with visual impairment and their teachers have embraced the use of assistive technologies and would love to continue using assistive technologies in their education. This could be attributed due to the benefit which students with visual impairment are enjoying from from assistive technologies while using them in their education.

Similarly, Hsieh et al., (2019) assert that both teachers and students with visual impairment have embraced the use AT to improve communication and collaboration in the classroom. Teachers always think that making students with visual impairment effectively use assistive technologies, increase student's engagement and participation while students with visual impairment appreciate the independence and autonomy it provides them in their learning.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presented the summary, conclusion, and recommendations and suggested the research areas for further study. These presentations were aligned with the study objectives.

5.1 Summary of Finding

The investigation found that while there are some assistive technologies in the resource room, both their number and diversity are insufficient. Assistive technologies for students with low vision found in these schools are screen magnifiers, audio recorders, phones with memory cards, screen readers while assistive technologies for students who are blind were found to be Audio recorders, CCTVs, computer installed with JAWS. Additionally, some students with visual impairment indicated that they are uncomfortable using some of the complicated devices. students with visual impairment are either not allowed to use them or cannot use them when they are needed most urgently to support their learning due to either inadequate in numbers in the schools and their wanting conditions which needs repair or are not in usable condition. These statements suggest that secondary schools, particularly those with students with visual impairment, are in dire need of well-equipped assistive technologies resource rooms.

The study also found out that students with visual impairment in the targeted secondary schools were not using assistive technologies to their full potential throughout the learning process this was attributed to lack of the necessary

knowledge and skills, competency and the extend of exposure to the assistive technologies. Another finding revealed that, the schools lack variety of recording assistive technologies, students with visual impairment is forced to rely on their basic phones equipped with memory cards. There was also indication that irregular power supply has significantly hampered the use of assistive technologies for students with visual impairment learning. In this instance, the school's power supply is unstable, which makes it difficult for assistive technologies like the computers that are available to function.

The results showed that secondary school teachers should have the chance to receive training on using different assistive technologies, either through workshops and seminars or through in-service channels. The findings also suggested that a school may be able to acquire specific assistive technologies equipment from a sister school if it is not currently in use. This was due to the fact that working together offered a conducive environment for them to consolidate their assistive technologies knowledge.

The results also suggested that both teachers and students with visual impairment largely had positive perceptions towards the use of assistive technology as it enhances the teaching/ learning process and provides equal opportunities for all students to learn. students with visual impairment however, some findings suggest that some students with visual impairment have develop negative perception due to its complication to use as they think using JAWS is complicated but because they are not trained on how to use it.

5.2 Conclusions

Based on the results, the following conclusions were drawn:

Secondary schools do not have enough assistive technologies in relation to the number of students with visual impairment, and some of the devices are not in usable conditions.

The ability to use assistive technologies by students with visual impairment during the learning process is being hampered by their lack of the necessary knowledge and skills and their teacher's lack proper and specialized training in assistive technologies. Students' willingness to use assistive technologies during their learning process in secondary schools is encouraging; although they have challenges of using some of devices.

Another conclusion is that although there is still low usage of assistive technologies in secondary schools, students with visual impairment and their teachers have largely shown positive perceptions and are optimistic regarding the use of assistive technologies during the learning process. However, despite the fact that use of assistive technologies in the education of students with visual impairment is unavoidable, it may be challenging for students with visual impairment to maximize the benefit from these devices. This is due to unfavorable attitudes of the users, their teachers and those in authority.

5.3 Recommendations

The following recommendations may be considered crucial as per the outcome of this study;

To improve on the effective usage assistive technologies by students with visual impairment in their education, teachers should encourage students with visual impairment to get inexpensive devices such as memory cards in ordinary feature phones which can function as well as complex assistive technologies. The MoES

should make significant investments in assistive technologies by making sure secondary schools have enough of them to support students with visual impairment in their educational endeavors. The school administrators should prioritize repairing the available assistive technologies which are not in good working conditions in the school.

In order to increase the usage of assistive technologies by students with visual impairment, teachers should give them more time to practice the use of assistive technologies and chances to visit other schools with similar devices. There is need for the targeted secondary schools to install solar energy and/or have standby generators to avert the irregular power supply which has significantly hampered the use of assistive technologies.

There is a need for continuous professional development for secondary school teachers on the use of assistive technologies by MoES or school administration. This will equip them with the knowledge and abilities needed to assist students with visual impairment in using assistive technologies throughout the learning process.

5.4 Suggestions for further research

Based on the findings of the study and the recommendations, the researcher suggested that a study should be carried out in the near future in the following areas;

Assistive technology and its impacts on academic's achievement of learners with visual impairment in secondary schools.

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APPENDICES

APPENDIX I: INTERVIEW GUIDE TO SWVI

I am Owachgiu Christopher a student at Kyambogo University pursuing a Master's of Special Needs Education. I am conducting a research study entitled **Assistive Technology use in education of students with visual impairment in secondary schools.**

The usability of Assistive Technology existing in the secondary schools

1.1. What type of AT devices do you have in your school for SWVI?

1.2. In what conditions are the equipments for AT in your school?

How AT is used in education of SWVI in secondary schools

2.1 What AT can you use effectively?

2.2 What challenges do you have regarding the use of the different ATs?

2.3 How do you think you should be helped in order for you to use AT effectively when learning?

The perception of SWVI towards the use of AT during the teaching/learning process

3.1. How do you feel towards using towards using AT during the teaching/ learning process?

3.2. Would you love to continue using AT devices in your education or its an additional burden in your life?

THANK YOU

APPENDIX II: INTERVIEW GUIDE TO RESOURCE ROOM TEACHERS

I am Owachgiu Christopher a student at Kyambogo University pursuing a Master's degree in Special Needs Education. I am conducting a research study entitled **Assistive Technology use in education of students with visual impairment in secondary schools.**

The usability of Assistive Technology existing in the secondary schools

1.3. What type of AT devices do you have in your school for SWVI?

1.4. In what conditions are the equipments for AT in your school?

How AT is used in education of SWVI in secondary schools

2.1 What AT can you use effectively?

2.2 What challenges do you have regarding the use of the different ATs?

2.3 How do you think you should be helped in order for you to use AT effectively when learning?

The perception of SWVI towards the use of AT during the teaching/learning process

3.1 How do you feel towards using towards using AT during the teaching/ learning process?

3.3. Would you love to continue using AT devices in your education or its an additional burden in your life?

THANK YOU

APPENDIX III: OBSERVATION GUIDE

Aspect to observe	Items expected	Available	Comments
AT types available in the school	**Low tech devices**		
	Electronic globe		
	Large print		
	Card holders		
	Table lamps		
	Highlighters		
	Walking frame		
	Electronic magnifiers		
	Pencil grips		
	Magnifying glasses		
	Braille slate & stylus		
	Mid tech devices		
	Adapted keyboard		
	Talking watches		
	Talking calculators		
	Audio recorder		
	Talking books		
	Audio phones		
	Electronic dictionaries		
	Braille typewriter		
	Tape digital recorder		
	Talking computer		
	Braille Perkins		

	High tech devices		
	CCTV		
	Projector		
	Digital book		
	Braille embosser		
	Scanners		
	Screen readers		
	DAISY readers		
	Screen magnifiers		
	Voice recognition software		
	Talking scientific calculator		
	Pal scanner		
	Blaze ET		
	Embossers		
	Orbit readers		
	Victor reader		
	Computer with screen magnifier		
	Hardware and software that translate speech-to-text and vice versa		
	Computer with screen reader		

APPENDIX IV: INTRODUCTORY LETTER

KYAMBOGO UNIVERSITY
P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website :www.kyu.ac.ug Email: drgt@kyu.ac.ug
Directorate of Research and Graduate Training
Office of the Director

Date: 14/09/2023

TO WHOM IT MAY CONCERN

RE: OWACHGIU CHRISTOPHER

Dear Sir/Madam,

This is to introduce to you the above-named student Reg: No 21/U/GMSM/14594/PE pursuing a Master of Special Needs Education, Department of Visual Impairment Studies, Kyambogo University.

She/he intends to carry out research on **"Assistive Technology Use in Education of Students with Visual Impairment"** in partial fulfillment of the requirements of the award of Master of Special Needs Education.

The purpose of this letter therefore is to request you to grant him/her permission to carry out his/her study in your institution.

Any assistance rendered to her/him will be highly appreciated.

Yours sincerely,

Prof. Bosco Bua
AG. DIRECTOR

KYAMBOGO UNIVERSITY
★ 14 SEP 2023 ★
DIRECTOR
DIRECTORATE OF RESEARCH AND GRADUATE TRAINING

APPENDIX V: INTRODUCTORY LETTER FROM THE DISTRICT

District Chairperson 0782071353
Chief Administrative Officer 0772480054
District Education Officer 0772910559
Chief Finance Officer 0772479937
Principal Assistant Secretary 0772516239
E-mail info@nebbi.go.ug
Website: http://www.nebbi.go.ug

OFFICE OF THE DISTRICT EDUCATION OFFICE
NEBBI DISTRICT LOCAL GOVERNMENT
P.O BOX 1,
NEBBI

Date: 02/10/2023

To:
The Management of Angal and
Parombo Secondary Schools

RE: MR. OWACHGIU CHRISTOPER RE: NO 21/U/GMSN/14594/PE

This letter serves to introduce the above referenced student to your office. He is pursuing Masters of Special Needs Education, from Kyambogo University. The student is carrying out a research project as one of the requirements in his quest for the attainment of master's degree, on the topic **"Assistive Technology Use in Education of Students With Visual Impairment in Secondary Schools".**

He has made choice of **Angal and Parombo Secondary Schools** in the district as areas for the research because of good number SNE children enrolled and environmental modification for easy accessibility in these schools.

As education department, especially Special Needs and Inclusive Education section in the district, we request you to positively cooperate with him in the endeavor.

Thanks

Yours

EDUCATION OFFICER
SPECIAL NEEDS EDUCATION
NEBBI DISTRICT LOCAL GOV'T

Lemiza Charles

Education Officer SNE NDLG

APPENDIX VI: CONSENT FORM

KYAMBOGO UNIVERSITY

P. O. BOX 1 KYAMBOGO
Tel: 041 - 4286792 Fax: 256-41-220464
Website: www.kyu.ac.ug, Email: drgt@kyu.ac.ug
Directorate of Research and Graduate Training

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 "**Assistive technology use in education of students with visual impairment in secondary schools".** It is hoped that the findings will help to enable the ministry of education and sports to gain insight into how SWVI use AT in secondary schools and therefore make appropriate adjustments to streamline the use of AT in education of SWVI and to help other researchers intending to carry out similar studies with references in order to produce more detailed and updated research in the same area.

You have been identified as one of the participants who can inform the study through an interview. The interview will focus on the usability of AT devices available in schools, your perceptions towards the use of AT and the utilization of AT devices in education of SWVI. The interview is likely to last for 20 – 30mins.

The purpose of this letter therefore, 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.

Thank you for your cooperation in advance,

Yours sincerely,

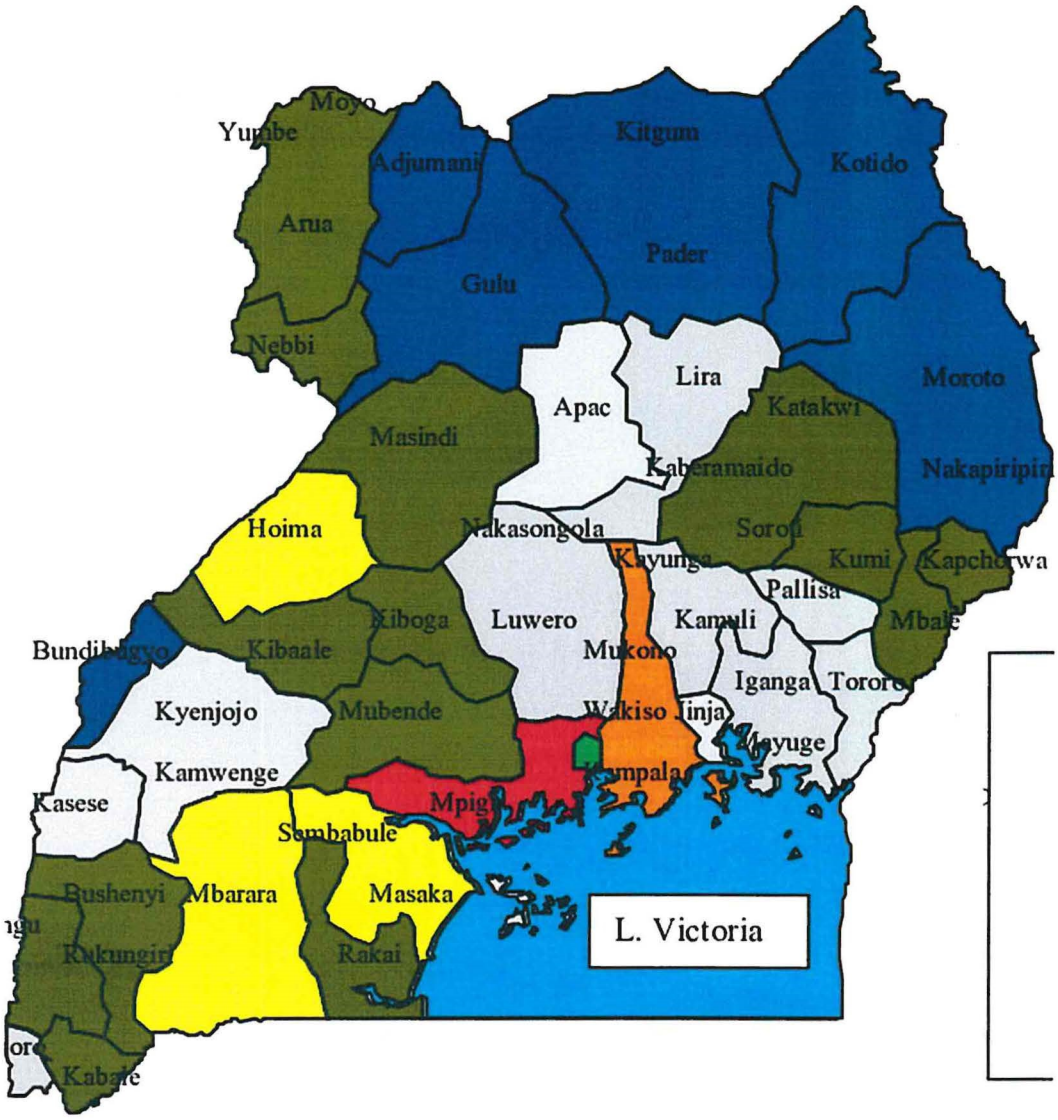
OWACHGIU CHRISTOPHER

21/U/GMSN/14594/PE

I have read and understood the purpose of the study and I hereby consent to participate.

Signature.....Date .....

APPENDIX VII: MAP OF UGANDA SHOWING NEBBI DISTRICT



APPENDIX VIII: MAP OF NEBBI DISTRICT