

**EXPERIENCES OF STUDENTS WITH VISUAL IMPAIRMENT DURING  
INFORMATION COMMUNICATION TECHNOLOGY BASED  
INSTRUCTION: A CASE OF ONE SECONDARY  
SCHOOL IN GULU CITY**

**BY**

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

**OCTOBER, 2024**

**DECLARATION**

I, **KAMONDAI MARY NJOKI**, hereby declare that this dissertation is my original work and has never been presented for a master's degree in any other university for the same award.

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## **APPROVAL**

The inscription and presentation of this dissertation was written succeeding the guiding principle of supervision of research project put down by Kyambogo University and hereby submitted to the graduate board with our approval as the candidate's university supervisors.

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## **DEDICATION**

I dedicate this dissertation to my late dad, **Mr. SAMWUEL KAMONDAI** who died during the writing of this dissertation. Beloved Dad, Rest in Eternal Peace.

## **ACKNOWLEDGEMENT**

I owe much gratitude to the Institute Leadership team of the Little Sisters of Mary Immaculate of Gulu for their material and spiritual support.

Secondly, I wish to thank my colleagues whose positive criticism culminated in writing up what constitutes the content of this book.

I am grateful to my supervisors Dr. Niyisabwa Odette Tumwesigye and Dr. Bisuulwa Abdu for their generous constructive guidance, support and encouragement through the process of this study.

I wish to extend my appreciation and gratitude to Next Generation Leadership Programme through University of Kisubi for offering me a scholarship which enabled me to pay my tuition and functional fees during my study.

Special acknowledgement goes to my mum Margaret, brothers and sisters whose encouragement contributed greatly to this study.

Finally I cannot forget all my participants who deserve special thanks for their cooperation during the interviews.

God bless them abundantly.

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## LIST OF ACRONYMS

AI	Artificial Intelligence
AT	Assistive Technology
BBC	British Broadcasting Corporation microcomputer System
CCTV	Close Circuit Television
CD	compact Disc
Col	Community of inquiry
CRPD	Convention on the Rights of Persons with Disabilities
DAISY	Digital Access information Systems
ECC	Expanded Core Curriculum
GPS	Global positioning System
GSMA	Global System for Mobile Communication Association
ICT	Information and Communication Technology
IETA-VI	Intelligent Electronic Travel for Visually Impaired
IT'S	Information Technology
NLP	Natural Language Processing
NVDA	Non-Visual Desktop Access
PWDs	Persons with Disabilities
SWLV	Student with low vision
SWVI	Student with visual impairment
TVI	Teacher of the visually impaired
UACE	Uganda Advanced Certificate of Education
UCE	Uganda Certificate of Education
UNESCO	United Nations Educational, Scientific and cultural Organization

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## ABSTRACT

Technology is largely viewed as the best enabler of special and inclusive education due to its profound ways in which it not only breaks access boundaries, but significantly how it fosters independence for students with disabilities, as well as interdependence among students with and without disability. This study examined the experiences of students with visual impairment in regards to the use of ICT, particularly online platforms for instructions, soft-copy learning materials, and portable audio devices in one of the secondary schools in Gulu City in Northern Uganda. This school was chosen because it is an inclusive school with a department for special needs and an ICT laboratory for students with visual impairment. The study was guided by social model of disability as a theoretical framework to try to understand the experiences of students with visual impairment during ICT based instruction. This study adopted a qualitative research approach and a case study design was used. The target population for this study was one secondary school teachers and students with visual impairment who were purposefully selected to participate. Out of 5 teachers in the department of special need 4 teachers teaching ICT were chosen and 6 students out of 24 students with visual impairments participated. Semi-structured interview guides were utilized in collecting the data. The data obtained were thematically analyzed by the researcher reading through the transcripts and listening to the audio recordings to familiarize with the data, created initial codes, recognized emerging themes, reviewed these themes, defined and labeled the identified themes, and finally compiled the report. The findings revealed that online instruction offers specialized support and adaptability to individual needs, yet learners still face enormous difficulties in navigating and interacting with the user interface of platforms such as Zoom and Google Meet. Digital learning materials reduce reliance on bulky braille books, challenges remain for teachers and students alike, in adapting to soft copy, materials for subjects like mathematics. Audio devices provide alternative means of accessing educational content, and importantly for learners, it helps them to cope with fast-pace teachers, but challenges such as power outages and restrictive school policies, where students are not permitted to carry the devices with them back home still remain. Despite these challenges, online instruction, soft copy notes, and audio devices hold promise in enhancing educational access and outcomes for students with visual impairment. Collaborative efforts from educators, policymakers, and technology developers are needed to develop accessible and inclusive educational resources for all students. The study came up with several recommendations such as enhancing usability and user experiences, ensuring devices accessibility and usability, comprehensive training programs for both teachers and students on how to effectively use online platforms for education, policy advocacy and addressing accessibility barriers to mention a few by calling upon the ministry of education and sports to conduct regular usability assessment and user testing sessions with visually impaired students to identify and address usability issues ensuring digital learning materials are intuitive, easy to navigate, and responsive to diverse learning needs of students with visual impairment during ICT based instruction in secondary schools.

# CHAPTER ONE

## INTRODUCTION

### 1.0 Introduction

This study aimed at investigating the experiences of secondary school students with visual impairments in Information Communication Technology (ICT)-based instruction. This chapter provided an overview of the research background, state the problem being addressed, outline the theoretical, contextual frameworks guiding the study, clarify its purpose and objectives, articulate the research questions, justification of the study, define the scope, highlight the significance, and explain key terms.

### 1.1 Background of the study

Information Communication Technology (ICT) encompasses technologies facilitating information access via telecommunications. While bearing similarities to IT (Information Technology), ICT primarily emphasizes communication technologies. This comprises wireless networks, mobile phones, the internet, and various other communication devices (Bekalu, et al., 2021).

Before ICT came into use in schools, Microcomputers became available for the consumer market and sparked governmental initiatives to frequently drive the fear of falling behind in the technological race and by the end of the 1980s, many nations began to manufacture and distribute their own brands of microcomputers which were known as BBC, Acon, and Tomson (Guzdial & Du Boulay, 2019). Over time, technology emerged to be used in education and caused changes in the lives of students. Visual impairment occurs when an eye of an individual or visual

system is functionally limited due to a disorder or disease, leading to a reduced ability to perform daily activities (Deme et al., 2024).

The definition emphasizes functional limitations in visual impairment, covering both blindness and low vision. For this study, "visual impairment" refers specifically to students who are blind or have low vision.

The United Nations Convention on the Rights of Persons with Disabilities (CRPD) laid the legal groundwork for addressing disability issues. It mandates inclusive education and the provision of necessary support to ensure the success of children with disabilities (UN, 2016).

In response to this international treaty, 173 nations have officially ratified the CRPD and are actively shaping new policies and reforming their education systems to align with its principles. As a result, this approach has facilitated better access to both primary and secondary education for students with visual impairments. Moreover, to enrich the teaching and learning process, ICT has been tailored to accommodate the diverse needs of these students (UN, 2016).

ICT has become an important tool in education in current times. Issues surrounding the utilization of technology in educational settings to train students with visual impairments persist. Findings and substantial concern arise from the fact that more than 90% of students who could potentially derive advantages from ICT lack access to these resources, underscoring a pronounced and unaddressed demand for such services. Only 5 to 15 percent of children with impairments have their ICT needs met (Campado, Toquero & Ulanday, 2023).

The world wide web was created to offer updated services that aided in the atmosphere of computer-assisted teaching and learning, nonetheless both in

affluent and developing nations, the inclusion of computers in academic curricula has generated a number of debates (Montenegro, Batanero & Cerero, 2023).

As of the end of 2016, global ICT deployment statistics showcased significant numbers, with 4.8 billion distinct users being equivalent to two-thirds of the world's population who had subscribed to mobile phone services. Notably, this count excludes the considerable number of individuals who collectively utilize these devices (GMSA Intelligence, 2017).

Approximations suggest that out of the expected 860 million new users worldwide by 2020, the Asia Pacific region contribute two-thirds of this growth (GMSA Intelligence, 2017). It was projected that by 2020, approximately 5.7 billion individuals, constituting 75 percent of the world's population, would be utilizing mobile services (GMSA Intelligence, 2017). Aware that persons with visual impairment constituted 2.95 % of the world population, the implication is that 253 million persons with visual impairment would be using ICT (Ackland, Resnikoff, & Bourne, 2018).

The percentage of people using the internet is equally likely to grow tremendously. Research shows that, 3.6 billion people will have accessed the internet by 2020 and the figure is likely to increase to 4.7 billion or 60% of the world's population by 2040 and these figures are a direct indication of the need to prepare teachers who shall take their students with visual impairment to the 21<sup>st</sup> century technological era (GMSA Intelligence, 2017).

In Kenya, advancements in teacher preparation programs and increased training of teachers have led to improvements in the education of learners with visual impairments, attributed to ICT initiatives. This program, aimed at instructing the

fundamentals of ICT to visually impaired students to enable them access educational-content online and build marketable skills, that benefits 1, 700 Kenyan's students (LaSaine, 2015).

Uganda has instituted a robust Ministry of Information, Communication, and National Guidance, tasked with offering strategic and technical guidance on policy, legal aspects, regulations, and strategies within the realm of the ICT sector. Subsequent to this establishment, advancements in ICT have brought about substantial transformations in the methods of information collection, storage, processing, dissemination, and utilization. Consequently, this technological evolution has rendered ICT a potent instrument for driving modernization and overall development (Chari, 2022).

Strides in the ICT sector's strategy have been taken to establish an economical, attainable, durable, and safeguarded digital infrastructure and connectivity nationwide. This serves as the fundamental basis for harnessing the educational potential of ICT. An extensive optical fiber network, jointly owned by both government and private entities, extends over approximately twelve thousand kilometers, encompassing 49% of all districts and 24% of sub-counties. In order to enhance service provision and encourage the adoption of e-services, the government has laid the groundwork for shared co-infrastructure. Notably, this includes the creation of a national data center and disaster recovery sites. These foundational elements are designed to facilitate cost-effective, reliable, and secure communication within the education sector and beyond (Birhanu, 2015).

In Uganda, the alignment of the computer studies syllabus in upper secondary education with Vision 2040 includes addressing hardware, software, data

communication, security, ethical concerns, and emerging technologies. The Ministry of Education introduced a competency-based lower secondary computer curriculum covering 16 topics across four themes: computer systems, data management, ICT safety, and publications. However, the curriculum predominantly focuses on basic computer skills and internet usage for educational purposes. The Revised National Policy on Education in 2014 advocated for the integration of ICTs for pedagogical purposes across all education levels (Tshukudu et al., 2023).

Ugandan secondary schools faced an unexpected hurdle in integrating ICT into teaching to accommodate students with visual impairments. This inclusion mandated ICT proficiency for all students, regardless of visual impairments. Despite the emphasis on ICT implementation, there is limited understanding of the experiences of visually impaired students during teacher-led instructions. Teachers normally play pivotal role in equipping students with visual impairments with essential ICT competencies. The insights and expertise of teachers significantly molded their approach towards supporting these students in acquiring the requisite skills (Tshukudu et al., 2023).

In Gulu City, ICT was introduced to a visually impaired student in a school in 2019, supported by UNICEF and UNESCO through the United Partnership on the Rights of Persons with Disabilities. They provided computers installed with software tailored for students with visual impairments (Tayebwa, 2022). Later, the Oyster & Pearls-Uganda organization trained both visually impaired students and teachers on computer software called Job Access with Speech, specifically designed for the blind and visually impaired. Each teacher with visual impairment was provided with a laptop computer and internet access to simplify their work.

Furthermore, the organization purchased the entire library of texts, including novels and plays used in grades S1 to S6, which were scanned to enable students to access them on their devices or use JAWS for navigation in DAISY format (Ayugi, 2017). However, despite the availability of ICT facilities, students are still facing challenges in ICT skills in this school. It is upon this background that this study was conducted to try to link experiences of students with visual impairment to ICT based instruction in secondary schools.

### **1.2 Statement of the problem**

Investing in the quality of education is crucial for national development and human resource development (World Bank group, 2021). That with standing there has been significant investment in ICT equipment and tools for students with disability, particularly those with visual impairment. For example, UNICEF Uganda alone under the Accessible digital textbook project has donated over 810 laptops to 20 primary schools, (UNICEF, 2023). Despite significant efforts by the government of Uganda, particularly the Ministry of Education and Sports, to invest in electronic readers, computers, accessibility software, and training, there is little knowledge of how to use all these devices. None use of devices is a big challenge.

There is urgent need to gather data on the experiences of students with visual impairment regarding their interaction with ICT tools, including audio devices, computers, and digital curriculum resources such as soft-copy textbooks and notes. This study intended to examine students' engagement with online instruction, utilization of audio devices, e-readers, and digital resources like soft-copy textbooks and notes. By addressing these objectives, the research targeted to uncover the challenges and opportunities faced by this demographic. Ultimately, the study wished to contribute to a deeper understanding of how ICT can facilitate

inclusive education for students with visual impairments, informing strategies for improvement.

### **1.3 Purpose of the study**

The study examined the experiences of students with visual impairment during ICT-based instruction in one secondary school.

### **1.5 Objectives of the study**

- i. To examine whether students with visual impairment benefit from online instruction
- ii. To investigate the experiences of students with visual impairment on notes given in soft copies.
- iii. To establish how students with visual impairment use Audio devices during ICT instruction.

### **1.6 Research Questions**

- i. What are the benefits of online instruction to students with visual impairment?
- ii. What are the experiences of students with visual impairment on notes given in soft copy?
- iii. How do students with visual impairment use the Audio devices during ICT instruction?

### **1.7 Justification of the study**

Up to now there is no systematic study of examining the experiences of students with visual impairment during ICT based instruction in this secondary school has been done in Gulu City, yet there are evidences of the fact. Since the time ICT was

introduced to a student with visual impairment in 2019, in the school of study. Government has continued to support students with equipment for ICT. There is no information of how these students interact and utilize the devices provided. Unless a thorough examination is undertaken, the benefits of online instruction, the investigation of students' experiences on notes given in soft copy and exploration of utilization of audio devices, there will be little knowledge, none use of the resources and lack of utilization of devices provided. That was why this study was relevant and urgent. It must be clear how the students with visual impairment benefit interact and utilize the available ICT devices available. This will help to gage strategies to improve the learning of students with visual impairment in secondary schools.

## **1.8 Scope of the study**

### **1.8.1 Geographical scope**

The research focused on one secondary school located in Gulu City, Northern Uganda. This is an inclusive school with an annex specifically for students with visual impairment. A significant portion of the student body originates from Gulu City, with others coming from nearby districts such as Amuru, Gulu, Omoro, Kitgum, and Nwoya, all situated in Northern Uganda.

### **1.8.2 Content scope**

This study concentrated on examining experiences of students with visual impairment during ICT based instruction. It examined the benefits of online instruction, investigated the experiences of students while using notes given through soft copy and established the ways in which students with visual

impairment used the audio devices during ICT based instructions in secondary schools.

### **1.8.3 Time scope**

The research took a period of one year, from 2023 to May 2024, covering planning, proposal writing, data collection, analysis, and report writing.

### **1.9 Significance of the study**

It is hoped that the study will contribute in the following ways:

1. Serve as awareness to the teachers about promoting ICT among learners with visual impairment.
2. Help the Institutions to identify ICT gaps that students with impairment experience during ICT based instruction so as to equip them with suitable skills.
3. The study's findings could serve as a basis for raising awareness among teachers about the significance of integrating modern assistive technology devices into the instruction of ICT for visually impaired students.
4. Support teachers in effectively engaging visually impaired students during the teaching process by identifying suitable applications and devices.
5. Educate teachers about the specific types of ICT that could be most beneficial for students with visual impairments, and allocate funds for procuring ICT devices tailored to their needs.
6. By establishing experiences of students with visual impairment during ICT based instructions, it may create opportunities for subsequent practical investigations within the realm of ICT.

### **1.10 Theoretical Framework**

The researcher adopted the social model of disability. Disability activists came up with this model in response to the civil rights movement in the late 20<sup>th</sup> century. In the 1960s and 1970s people with disability were excluded from the society. The disability rights movement began as people started to question their experiences (Oliver, 2013).

It emphasizes that societal barriers like inaccessible buildings or limited information access, along with negative attitudes, contribute to disability rather than inherent impairments. This model serves to identify hindrances that render life challenging for persons with disabilities (PWDs).

An environment filled with barriers will create significant differences in experiences for disabled people. Conversely an inclusive environment will offer minim level of inclusion experiences. To improve the experience of disabled people, this model stresses the removal of these obstacles which leads to equality, granting PWDs greater independence choice, and control, thereby enhancing their lives. Furthermore, the study utilized the capabilities framework, enriched by insights from the social model of disability (Oliver, 2013), to comprehensively explore the subject matter.

According to Dawn (2018), altering one's perspective critically holds noteworthy ramifications for the formulation of laws and policies pertaining to disabilities. A recognition appreciation is emerging among individuals with visual impairment; however, this recognition is shaped by the structures, practices, and attitudes that hinder individuals from fully exercising their capabilities.

A variety of factors influence academic advancement, encompassing background, encouragement and support, physical infrastructure, attitudes, types of educational literacy, and English literacy. This confirms the model's critics who argue that these factors can have distressing consequences for disabled individuals, particularly students with visual impairment (Doikou et al., 2022).

The social model of disability helps us to recognize barriers that make life harder for people with disabilities. Removing these barriers creates equality and offers disabled people independence, choice and control. The social model seeks to change society in order to accommodate people living with disability not changing the person with disability.

Social model is relevant to the study at hand, in that it advocates for inclusivity, it addresses holistically all the needs of an individual rather than focusing only on the impairment.

Social model is critiqued for its flawed understanding of the relationship between impairment, disability and society, setting a framework that needs clarification therefore limits to its own aim of achieving inclusion (Oliver, 2013).

The researcher was mainly driven by the idea of social inclusion which is a new paradigm that advocates for inclusion of persons with disabilities in the various environment of society. By encouraging an inclusive environment through the adaptation of teaching methods during ICT based instruction taking into consideration acceptable, skills, interest and experiences of each student with visual impairment.

## **Theoretical Review**

This theoretical review critically assesses the application of the Social Disability Model in instructing ICT to visually impaired students in secondary schools. It examines experiences of students, focusing on education, and explores how this paradigm influences teachers' adoption of inclusive teaching methods and improved accommodations for students with visual impairments (Waldschmidt, 2018).

At the core of the Social Disability Model lies its acknowledgment of the profound influence of stigma and discrimination on individuals living with disabilities. Pioneering disability scholar Oliver (1990) underlines that "disability should be viewed as a societal concern rather than a mere 'medical' matter." This emphasizes the imperative to confront the detrimental beliefs and biases that frequently lead to the exclusion of people with disabilities.

These unfavorable attitudes can manifest prominently to students who have visual impairment. Signs of marginalization include, deficiencies in obtaining specialized training, not gaining access to relevant materials, and difficulties in purchasing adapted devices. This should be confronted all together to improve the challenges experienced by visually impaired students and ensure inclusion (Ondin, 2015).

Comprehensive teacher training aims to provide educators with essential skills and knowledge required to effectively teach visually impaired students. Without this training, creating inclusive and accessible learning environments may prove challenging (Ali et al., 2018).

The Social Disability Model offers a valuable framework for instructing ICT to visually impaired students, providing insights into the multifaceted challenges they

encounter. By acknowledging the interaction between personal impairment and societal factors, teachers can adopt more empathetic and informed approaches to support these students in their educational endeavors. This model prompts teachers to advocate not only for individual accommodations but also for systemic changes that foster inclusivity, equal access, and empowerment for all students, irrespective of their abilities.

### **1.11 Operational Definition of terms**

**Learning:** Is the process of acquiring, processing, and retaining information, forming the basis of knowledge. It varies for each individual; some grasp concepts quickly, while others may require more time or repetition to understand (Harrison, 2023).

**Information Communication Technology:** ICT involves telecommunications technologies that facilitate access to information. Although ICT shared similarities with IT (Information Technology), its primary emphasis is on communication technology. This includes wireless networks, mobile phones, the internet, and various other communication devices (Bekalu, et al., 2021).

**Visual Impairment:** This condition refers to reduced visual capabilities that impede everyday activities such as reading, driving, and watching television (Lee & Mesfin , 2023).

**Instructional Influence:** This is the ability of the different assistive technologies and the designed curriculum meant for instructing students with visual impairment effectively to enhance their learning processes (Hui & Singh , 2020).

**ICT based instructions:** This refers to current strives of utilizing computer-based stimulation on students' academic performance during teaching (Ali , et al., 2018).

**Students' experiences:** These are contemporary notions of students' know-hows that extend well beyond a traditional curriculum trends, societal, technological, assessment and pedagogy that include extra-curriculum activities of the students and how schools respond to help students manage their external commitments (Kamali et al., 2021).

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

In this chapter, the researcher reviewed relevant literature, exploring various authors' perspectives on the topic and their contributions to the field of study. This involved a thematic review of the literature, followed by a summary of findings and identification of research gaps.

#### **2.1 How students with visual impairment benefit from online instruction**

There is growing significance of online learning in global education. This approach enhances access to and quality of education for students with visual impairments and aligns with the UNSDG 4 agenda, aiming to achieve inclusive, equitable, and lifelong education for all by 2030 (Amponsah & Bekele, 2023).

According to Barden (2017), attending lectures online is more accessible for students with visual impairment compared to traveling to school. Adaptive technologies such as braille keyboards, voice-to-text software, and audio recordings are provided for their learning. With technology readily available in the form of computers, laptops, phones, or tablets, online classes are accessible to all students.

During the COVID-19 pandemic, many educational institutions transitioned to online teaching via video conferencing tools. To support the learning of students with visual impairments, accessible tools were implemented, incorporating inclusive features such as applications tracking students' participation by counting messages sent, hands raised, and speaking instances (Doush et al., 2023).

Online instruction empowers students with visual impairment to actively participate in classrooms alongside their peers without disabilities. It also extends the learning environment beyond physical classrooms, granting students access to and the ability to share information globally (Kisanga & Kisanga, 2022).

Curriculum Framework for Students with Visual Impairment (CFVI; Hewett et al., 2023), designed to equip young people aged 0-25 with the knowledge to understand the outcomes of their education and have a voice in it. The framework offers guidance on accessing information and using technology independently, fostering confident interaction, and cultivating awareness of individual potential (Loveys & Butler, 2023).

Online instruction significantly boosts participation among students with visual impairment by providing access to information and materials, navigation support, communication tools, skill development opportunities, and educational pathways preparing them for adulthood (Anselimus, 2023).

Online instruction offers students with visual impairment equal access and engagement in learning. This author advocates for collaborative efforts among stakeholders, individualized instruction, and specialized training for both students and teachers to enhance learning through technology (Kelly, 2023).

Online instruction supports self-directed learning, fostering cognitive presence as students with visual impairment work independently at their own pace. They suggest that instructors adapt social or shared learning tasks to suit the needs of students with visual impairment while promoting adaptability and challenging instructional practices (Ngubane & Khoza, 2021).

Community of Inquiry (CoI) facilitates the design of a holistic e-learning experience for students with visual impairments. They emphasize that ICT tools enable direct communication between students and teachers, particularly benefiting visually impaired students requiring access through various media (Ngubane & Khoza, 2021).

Open, Distance, and Digital Education (ODDE) offers unique opportunities for students with visual impairments, ensuring flexible and accessible learning experiences through mechanisms such as assistive teaching, accommodations, and adaptations in pedagogical, managerial, social, and technical support (Kocdar & Bozkurt, 2023).

The benefits of blended learning pedagogy enable students, including those with visual impairments, to discover, learn, practice, collaborate, and assess (DLPA). Assessment strategies incorporate adaptive learning technology via platforms like Web Assign, providing formative and summative assessments and timely feedback (Basitere et al., 2023).

The growing interest in virtual education, particularly with the increasing integration of technology into daily life enhances student engagement and practical achievement, offering significant potential for future exploration and development of technological skills in education (Onggirawan et al., 2023).

Students with visual impairments can use online course material effectively because of accessibility in online teaching and learning environments. However, the layout of many online courses creates barriers that prevent teachers and students with visual impairment from participating fully. Despite the abundance of assistive technology tools available to visually impaired students for computer and

internet usage, these solutions do not completely eliminate all access obstacles (Kurete, 2023).

Online learning supports students with visual impairments in managing educational involvement, social connections, and knowledge exchange. They emphasize the importance of providing suitable software, educational resources, and ample educational opportunities to enable students to acquire the necessary skills (Al Hosni et al., 2023).

Computer-based teaching methods improve students' understanding of ICT use and communication, which calls for their active participation in ICT-enhanced classrooms. Comi and his colleagues discovered that the practical incorporation of ICT in the classroom by instructors is contingent upon their ability to effectively integrate it into their teaching strategies (Comi et al., 2017).

Information communication technology plays a crucial role in enhancing educational opportunities for students with visual impairments. This assertion holds true as ICT has become integral to various forms of education (Douglas, et al., 2011).

Employment of contemporary assistive technology significantly impacts on how much of the curriculum is covered by teachers and how quickly visually impaired students complete their classwork and homework. Computers, Ipad, and tablets are a few examples of assistive technology in use. These tools are less cumbersome, quick, easier, efficient, and encouraging to students with visual impairment. They also promote independent learning (Achieng et al., 2015).

Online platforms undoubtedly have the potential to boost productivity through digital economies, thereby enhancing the efficiency of public and private services within African Education Systems (AES). However, at the heart of policy deliberations in Africa lay crucial questions regarding the outcomes, retention, and learning achievements of students with visual impairments. These inquiries have the power to reshape the education landscape, influencing teaching methodologies, delivery mechanisms, and the foundational pedagogical principles rooted in ICT (Barakabitze et al., 2019).

Information Communication Technology offers valuable resources for facilitating teaching and learning. It bridges the gap for students whose cognitive capabilities might otherwise not align with certain learning opportunities due to disabilities. For instance, a student facing challenges in deciphering text due to visual impairment can rely on a text-to-speech screen reader, acting as a "bridge" between the written content and the capacity to comprehend the information through auditory and cognitive channels (Jagota, 2018).

Online instruction attracts students with visual impairments to new technologies. As the school year concludes, a transformation occurs, with a majority of students eagerly embracing the opportunity to learn and acquire skills that contribute to their personal and social growth. Proficiency with computers being crucial for employment success, students with visual impairments expresses a desire to continue studying ICT (Osiceanu & Popa, 2015).

Online learning provides students with visual impairments the opportunity to access pertinent and timely information, facilitating their inclusion. In this context, information encompasses the knowledge that students with visual impairments can

gather from diverse sources, spanning print materials, online platforms, electronic resources, and oral communication. Students with visual impairments concur that information serves as a means and tool to engage with their surroundings. However, a dearth of information results in increased dependency and acts as an obstacle to their participation in certain social activities (Yeshanew, Xu, & Yuan, 2023).

Technologies are a vital component of life for adolescents, including students with visual impairment. These students benefit from resources just as much as their sighted counterparts. Assistive technology enhances awareness of both the possibilities and constraints that social media can pose for students with visual impairments. Social media should be incorporated in teaching practices so as to help students who are visually impaired to acquire life skills (Della & Jurberg, 2017).

Online awareness is crucial for education because it improves teaching methods and opens up new learning opportunities. It is also a helpful tool that raises the caliber of resources and makes it more interactive and interesting for students. Hence, it is imperative for educators to incorporate technology within their teaching practices to support students with visual impairments. This can be accomplished by combining unique techniques and materials with ICT use (Madina-Gracia et al., 2021).

Students with visual impairment should be instructed using technology emphasizing the need for collaborative efforts between teachers and other stakeholders. Tailored guidance and specialized training are crucial in this endeavor. Educational teams must address the diverse nature of the visual

impairment student population, recognizing the prevalent occurrence of additional disabilities among them and other distinctive attributes of these students (Khan & Mhmood, 2022).

Online course materials are effective because of accessibility in online teaching and learning environments. However, the layout of many online courses creates barriers that prevent teachers and students with visual impairment from participating fully. Despite the abundance of assistive technology tools available to visually impaired students for computer and internet usage, these solutions do not completely eliminate all access obstacles (Kurete, 2023).

Accessible video conferencing application with good learning features can help students with visual impairment when they participate in online classes. The two current video conferencing applications are zoom and MS Teams (Doush, 2023).

When teachers develop pedagogies, which make use of smart learning technologies in different environments, it helps students with visual impairment to cope with their learning needs (Li & Wong, 2021).

In a study across six sub-Saharan African countries, teachers generally expressed satisfaction with the processes and content of the ICT program (Agyei, 2021). However, Agyei notes that during the execution phase, crucial prerequisites for translating training concepts to the school level were lacking. This observation has significant implications for effective professional development aimed at seamlessly integrating ICT into curriculum-related tasks and school frameworks. Such integration has the potential to enhance teaching, particularly in analogous scenarios within the Sub-Saharan region.

## **2.2 Experiences of students with visual impairment on notes given in soft copy**

Digital technologies have ushered in a transformative era in education, streamlining tasks for students through the adoption of diverse software and tools tailored for presentations and projects. This shift has notably eased the academic journey for visually impaired students, offering alternatives to traditional, cumbersome textbooks (Haleem et al., 2022).

Computer laboratories stand as indispensable assets for visually impaired students, providing a specialized environment equipped with software and supplementary devices. Within these labs, students can engage in essential tasks such as writing, reading, and internet browsing, complemented by peripheral tools designed for braille reading and printing (Tiaiba & Bentouhami, 2023).

Despite the strides made in developing advanced assistive technologies, significant hurdles persist in ensuring equitable access to ICT resources for visually impaired students. Chief among these challenges is the limited availability of specialized tools and software tailored to their unique needs, posing barriers to their educational journey (Eligi & Mwantimwa, 2017).

In response to the demands of the 21st-century landscape, modern education places a strong emphasis on equipping students with foundational skills and media literacy essential for navigating the digital realm. This paradigm shift in educational approaches involves the integration of technological tools and methodologies into curricula, ensuring inclusivity and catering to the diverse needs of students, including those with disabilities (Tohara et al., 2021).

Digital technologies prove to be advantageous rather than hindrances for students with visual impairments. To optimize their benefits, educators must undergo

comprehensive training in ICT usage tailored to the needs of visually impaired students. This training aligns with global standards and empowers teachers to create accessible learning experiences. It also emphasizes delivering instructional content in digital formats consistent with Universal Design for learning principles, ensuring inclusivity in education (Montenegro et al., 2023).

Students with visual impairments now enjoy enhanced access to information and communication thanks to digital resources. Simsek et al., (2010) stress the significance of nurturing ICT competencies among visually impaired individuals to bridge societal gaps. By facilitating internet access, students can engage with peers and mentors, fostering social integration and enhancing vocational prospects. This underscores the importance of equitable access to ICT services for all learners, especially those with disabilities.

Holistic approach to special and inclusive education, emphasize the integration of accessible technological tools. These tools should prioritize usability and compatibility across various platforms. The adoption of free software enables comprehensive exploration of educational topics, fostering a favorable learning environment. Moreover, integrating students with visual impairments into mainstream classrooms encourages teachers to adapt instructional techniques, promoting inclusivity and diversity (Cardenas & Inga, 2021).

Complex objectives of providing ICT support to visually impaired students, including enhancing functional abilities and fostering independence. Teachers play a pivotal role in tailoring ICT solutions to individual student needs. This process begins with assessing students' competencies and educational requirements, followed by task analysis to identify areas requiring support. By selecting assistive

technologies aligned with students' abilities, educators empower visually impaired students to fully engage in academic and extracurricular activities, promoting their holistic development (Mulloy et al., 2014).

Teachers should use a variety of technology, including both common tools and accessible features, with their visually impaired students. In terms of hardware, teachers should instruct their students on a wide range of assistive technology. iPads, laptops, desktop computers, standalone or connected Braille displays, and Braille note-takers. These tools, though, are expensive and only available to those with strong academic credentials (Baker, Milne, & Ladner, 2019).

Selecting appropriate screen readers for students with visual impairments, tailored to the devices they use. For example, Voiceover for Apple products, ChromeVox for Chrome books, and either JAWS or NVDA for Windows PCs are commonly utilized. The choice of screen reader may also be influenced by recommendations from Teachers of the Visually Impaired (TVIs). Conversely, students with low vision often rely on various magnification software options on tablets and computers. These include integrated options like ZoomText or Fusion, a combination of ZoomText magnification and the JAWS screen reader. Teachers observe that while built-in options exist, students typically prefer mainstream or supplementary magnification software for better usability and functionality (Baker et al., 2019).

Practical strategies for visually impaired students to effectively navigate accessible documents, emphasizing structural elements such as headings and alternative text. These strategies significantly enhance reading efficiency and reduce cognitive

load, proving invaluable for students as they interact with digital content (Singleton & Neuber, 2020).

JAWS (Job Access with Speech) software as the most widely used tool among students with visual impairments, greatly simplifying various tasks. With JAWS, students can effortlessly access and download essential data, conduct Google searches, and send emails. Its intuitive interface allows users to execute commands through keyboard inputs, facilitating seamless workflow and enhancing overall productivity (Bhatt & Kumari, 2015).

Visually impaired students benefit from web-based drill programs, offering instantaneous access to content, personalized instructions, and progress tracking. These programs enable students to make significant advancements in vocabulary building, with sustained improvements even after the study period. Such technological interventions play a crucial role in fostering academic growth and independence among students with visual impairments (Kamali et al., 2021).

Technology provides valuable resources for facilitating teaching and learning. It bridges the gap for students whose cognitive capabilities might otherwise not align with certain learning opportunities due to disabilities. For instance, a student facing challenges in deciphering text due to visual impairment can rely on a text-to-speech screen reader, acting as a "bridge" between the written content and the capacity to comprehend the information through auditory and cognitive channels (Jagota, 2018).

Web-based solutions benefit students with visual impairments. Among these, My A + Math stands out as a web-based prototype designed specifically to aid in mathematics learning. This platform offers an interactive learning environment

incorporating speech control and algorithmic problem-solving features, thereby bolstering fundamental mathematical skills in visually impaired students (Shoaib et al., 2023).

Providing visually impaired students with suitable software activities. These activities enable students to efficiently access and manipulate lecture notes, saving significant time in the process. Effective utilization of educational resources not only enhances satisfaction for both students and instructors but also fosters knowledge-sharing among peers, facilitating academic achievement and collaboration (Eligi & Mwantimwa, 2017).

Teachers need literacy skills, usage of technical improvements, and training. On the other hand, he emphasizes the significance of creating coordinated interdisciplinary teams and networks for the development of evidence-based practices and educational programs (Argyropoulos et al., 2019).

Substantial influence of new technologies on societal involvement grant access to knowledge and information, these technologies reshape how individuals engage with the world. In an increasingly globalized society, the continuous generation and exchange of information significantly influence various facets of human existence. Educating students to navigate these dynamics demands educators possessing a distinct level of expertise. Their continual professional growth ensures an adaptable and dynamic approach to imparting skills to visually impaired students, enabling them to effectively participate in society (Drossel & Eickelmann, 2017).

Training of teachers in information and communication technologies (ICTs) has faced examination due to the continuous evolution of the educational landscape

towards a more personalized and innovative instructional approach, bolstered by digital tools. ICTs encompass a range of technologies employed across various educational levels and formats, aiming to generate and distribute information. This includes computers, digital tablets, mobile phones, virtual platforms, applications, and more. The significance of ICT in teaching students with visual impairments stresses the necessity for teachers to undergo training in digital competencies (Gallardo-Montes et al., 2023).

Teachers should give visually impaired students the fundamental, necessary, and technology-based skills they need to use simple, technology-based methods to get the information they need for their studies and daily lives. Additionally, it is essential allow visually impaired students orientation mobility support when attending classroom in order to maximize their meaningful involvement in a range of contexts, from extracurricular activities to classroom instruction. As students leave their separate educational institutions to engage in community and family life, this will prepare them for academic, professional, and community situations (Khakwani, A.B., Yasin, A., & Khakwani, K., 2023).

Technology-driven intelligent systems teach ICT to students with visual impairments. One key aspect is the ability to convert native languages into corresponding braille forms and vice versa. This conversion is most effectively achieved through an Artificial Intelligence (AI) based approach, especially leveraging Natural Language Processing (NLP) techniques. NLP, aided by finite automata, facilitates accurate translation of human languages and grammatical correction in the output. Such capabilities are particularly beneficial for students with visual impairments when interacting in different languages (Ali 2023).

Technology is hailed as a necessary element of our society with its effect on the educational system. ICT is inextricably linked to the educational process, and particularly to the pedagogical strategies used with blind or partially sighted students. On the other side, teachers are not thought of as being very resourceful. Teaching of students with visual impairment is centered on ICT knowledge teaching and training, as well as ICT integration in teaching these students. Although many teachers ignore many of these tools and software that are specifically designed for use with students who have visual impairments, some teachers are self-assured in their technological abilities (Ramos & Andrade, 2016).

### **2.3 The use of Audio devices by students with visual impairment**

Students with visual impairments rely on screen readers, which utilize synthesized text-to-speech and auditory cues, to access information displayed visually on devices. These readers support specialized keyboard or touch commands for navigating interfaces. Examples include Voiceover for Apple devices, JAWS for Windows devices, and the open-source NVDA. However, screen readers are only effective when interfaces are designed to accommodate them (Payne 2023).

Students with visual impairments can engage in hands-on activities through adaptive methods and assistive technology. Chemical laboratory experiments are modified with adaptations like the Science-voice Talking Lab quest and tactile tools, enabling participation and learning in science labs (Rashid & Chehadeh, 2023).

Visually impaired students grasp science concepts more effectively when presented in real-world contexts. They advocate for Problem-Based Learning

(PBL) and Sonified Learning (SL) modes, augmented with assistive media such as audio-based computer and mobile learning games (Ediyanto 2023).

Task-specific aids for visually impaired students, utilizing Audio notification and Voice-responsive interfaces. Their prototype device, the "Surfer Pad," facilitates navigation of audio-based activities like audio instruction, audiobooks, and interactive queries (Valencia et al., 2023).

The use of comic books as a novel voice-synthesized learning method for visually impaired students. This approach extracts semantic content from comics, stores it in a database, and generates audio streams in multiple languages, bridging the gap in learning activities reliant on visual content (Samarawickrama et al., 2023).

Visually impaired students benefit from the JAWS (Job Access with Speech) application, enabling access to computers through speech. This technology allows them to interpret on-screen content audibly, aiding in learning Microsoft Office Word and other tasks (Mulyati et al., 2023).

Audio devices assist visually impaired students in comprehending and narrating events similarly to sighted individuals. These devices effectively convert visual information into vocalized information, significantly enhancing comprehension for visually impaired individuals (Zengin et al., 2023).

Persons with visual impairments who live in low-income families experience a range of educational difficulties that are worsened in developing countries. Students generally lack access to digital assistive equipment like screen readers, so they must rely on braille and audio recordings to access content. For many courses,

there is a severe lack of high-quality audio books, leaving students scurrying for alternatives to complete their education (Vashistha et al., 2015).

Teachers encounter difficulties when instructing students with visual impairment, teaching touchscreen and screen exploration. Inability to use screen reader movements (such as double-tapping to choose or twisting to engage the rotor) and usability issues are some problems that students encounter. Screen readers have trouble with example features that change the focus (Baker et al., 2019).

Adoption of mobile audio-tactile learning environments to accommodate the prevalent shift towards graphical information presentation. These environments enable students with visual impairments to access authentic educational content tailored to their unique needs, fostering integration and inclusivity (Melfi et al., 2020).

Recognizing the challenges faced by some teachers in effectively educating visually impaired students, professional training in low vision is vital. This training equips teachers with knowledge of technologies such as closed-circuit television (CCTV) systems, optical magnifiers, and speech output devices, essential for students' daily lives. Integration of low vision classes into academic curricula enhances teachers' understanding and support of visually impaired students, especially when utilizing ICT (Taha & Musa, 2023).

The evolving nature of the learning environment, which presents significant navigational challenges for students with visual impairments. Many students in developing countries lack access to technical assistance, relying instead on sighted individuals for navigation, limiting their autonomy. To address this, the Intelligent Electronic Travel Assistance for the Visually Impaired (IETA-VI) was developed.

This system aims to enhance independence by providing convenient and safe navigation assistance through various functionalities (Shuaibu et al., 2015).

In addition, Shuaibu et al., (2015) revealed that achieving this goal involves furnishing a visually impaired student with voice-based notifications concerning obstacles' distances along their path. Additionally, it encompasses delivering localization and surveillance capabilities through GPS, GSM, and voice recognition. The device integrates various technologies, including voice recognition, ultrasonic detection, GPS communication, and voice synthesis.

Audio devices are used for teaching English as a foreign language to visually impaired students. However, many teachers encounter difficulties in creating or utilizing instructional materials with these devices. A significant number of teachers lack awareness of available instructional tools, and the scarcity of skilled teachers exacerbates the challenge. Most teachers reported using laptops and CD players in their teaching practices (Efstathiou & Polychronopoulos, 2015).

Audio-tactile methods support visually impaired students in using graphic information during math exercises. This approach involves displaying pictures on tablets with tactile prints, allowing students to explore picture elements through audio descriptions of varying detail levels. The level of detail adjusts automatically based on students' individual knowledge vectors and the types of mistakes they make (Mackowski et al., 2023).

Audio Supported Reading (ASR) combines braille or screen magnification with text-to-speech technology. Screen reader tools enhance how visually impaired students interact with text, increasing reading speed and comprehension. ASR technology improves text comprehension efficiency, thereby expanding

opportunities and overcoming barriers posed by slow reading rates (Jackson, 2021).

ICT serves as a bridge for students whose cognitive abilities may not align with traditional learning methods due to disabilities. For example, students with visual impairments can utilize text-to-speech screen readers to comprehend written content through auditory and cognitive pathways, bridging the gap between the text and their ability to understand it (Jagota, 2018).

## **2.4 Summary and Gap**

The literature reviewed corresponded that teacher ICT based instruction enhances students' experiences which play a vital role in providing high level ICT skills to students with visual impairment. Different scholars noted that, ICT based instruction is a great means of facilitating adaptation, use of ICTs in the teaching process. The management of ICT by teachers plays a crucial role in shaping the learning experiences of students with visual impairments. Utilizing adaptive learning technology enables these students to develop ICT skills and knowledge effectively. Research literatures further feature the advantages of online teaching for students with visual impairments. Numerous studies emphasize that online teaching notably enhances participation, providing improved access to information, materials, navigation, communication, social interaction, and educational opportunities. These advancements ultimately contribute to better preparing visually impaired students for their future endeavors. In terms of how students access notes through soft copy a substantial number of scholars highlighted that the widely used software by students is JAWS which make their life easy. They can download important data, carry out Google searches and send emails. Literature also emphasized the use of audio devices such as screen readers

which are synthesized text-to-speech and other auditory cues to communicate information displayed visually and they support the key board or touch commands for navigating interfaces. However, students experience inability to use screen reader movements.

The literature review reveals that despite the plethora of assistive technology tools available to students with visual impairments, these solutions do not completely eliminate access barriers (Kurete, 2023). These disparities give emphasis to the existence of an accessibility gap in information and services for students with visual impairment. This study seeks to investigate and address this gap by examining the experiences of students with visual impairment during ICT-based instruction in secondary schools.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This chapter outlines the systematic steps employed by the researcher during the study on experiences of students with visual impairment: Information communication technology based-instruction. A case of a secondary school in Gulu City. It delves into key aspects following the objectives; the benefits of online instruction, the experiences of notes given in soft copy and the use of audio devices by students with visual impairment, the chosen research approach, study design, area of study, study population, sample size and sampling technique, method of data collection, data collection instruments, pilot study, data collection procedures, data Analysis, credibility and trustworthiness, ethical considerations, delimitations and limitations of the study.

#### **Research approach**

Creswell (2015) defines a research approach as the plans and procedures guiding research, from broad assumptions to detailed methods of data collection, analysis, and interpretation. Likewise, Grover (2015) describes it as a strategy of inquiry. Research approaches generally fall into three categories: qualitative, quantitative, and mixed methods. This study adopts a qualitative research approach, which seeks to understand the significance individuals or groups attribute to a social or human issue. This strategy includes developing, evolving questions, conducting inductive data analysis to identify underlying patterns, and drawing conclusions about the data (Creswell, 2014). Cohen et al., (2007) added that qualitative researches appeal and illuminate qualities while retaining credibility. In order to fully understand participant perspectives throughout the study process, the researcher emphasizes

their interpretations over those offered in the body of existing literature or from the researcher's perspective. The researcher used this approach to enable her get specific information about the experiences of students with visual impairment, study it and build a holistic picture and detailed views from the participants in their natural location.

### **3.1 Research Design**

A research design serves as a blueprint, streamlining various research operations to maximize efficiency and yield ample information while minimizing effort, time, and costs. This design is particularly suitable for gathering data from a relatively limited number of cases within a specific timeframe. It involves administering questions to sample individuals to describe events, organize data, and portray variables (Kratochwill et al., 2023).

Drawing from this concept, the present study employed a case study design, which involves an in-depth investigation of a person, group, or unit, aiming to generalize findings across multiple units (Hollweck, 2015) & (Yin, 2014). The researcher used a case study design to understand the students by developing a detailed explanation of the students' lived experiences on ICT based instruction in the school of study.

### **3.3 Area of study**

The focus of the study was to examine the experiences of students with visual impairment during ICT based instruction in Gulu high secondary school in Gulu City. The researcher selected this school because it offers inclusive education and have projects and donation that support students with visual impairment. It also has an annex and ICT laboratory with specialized facilities that supports ICT instruction of these particular students. In addition, it has a well-established

department for special needs with teachers who are involved in teaching ICT to students with visual impairment.

### **3.4 Study Population, Sample Size and Sampling Techniques**

#### **3.4.1 Study Population**

Study population refers to the total collection of cases that meet a specific designation or set of criteria, encompassing various objects or items such as individuals, events, books, concepts, cities, or countries (Shu, 2014). In this study, the population consists of teachers and students with visual impairment within the Department of Special Needs at the school under investigation. This includes 24 students with visual impairment, comprising 9 girls and 15 boys distributed across all classes from S1 to S6, along with 5 teachers working in the Department of Special Needs.

#### **3.4.2 Sampling Techniques**

Sampling involves selecting a representative part of a larger population to determine characteristics of the whole population, ensuring each individual has an equal chance of selection (Etikan et al., 2016). The researcher employed purposeful sampling, specifically criterion sampling, where cases are chosen to exemplify extreme scores. Purposeful sampling aligns with research questions, deliberately selecting relevant participants based on specific characteristics, aiming for information-rich cases (Bryman, 2016; Etikan et al., 2016).

In this study, purposeful sampling was used. Only four teachers who were teaching students with visual impairment and had training in ICT out of five teachers in the department were selected and 6 students with visual impairment from S2-S4. The criteria used to select these 6 students was to pick those who started studying from senior one in the school of study. The purpose of doing this was to get those

students who had experiences in ICT since some students who transferred from other schools claimed to have started learning ICT from this school even though they were in S2, S3 or S4. Senior ones had just reported and they were being introduced to the devices while in S5 those admitted had not reported at all. Two students with visual impairment were selected from each class, one with low vision and one blind student. In S2&S3 gender was considered. In S4 there were only girls so the eldest and the youngest were selected totaling to 10 participants. This sampling technique ensures selection of participants who are knowledgeable and willing to participate, and also choosing participants who are assumed to have useful and relevant information for the study.

### **3.4.3 Sample Size**

Sample size refers to the number of individuals selected from a larger population to accurately represent it. By studying this sample, researchers can make fair generalizations back to the population from which they were chosen (Julious, 2023). The researcher used a sample size to enable her collect sufficient data and have an estimate with a desired level of accuracy.

### **Table 3. 1: Sample of participants**

S/N	Category	Selected participants	Number of participants
1	Teacher-RE Teacher-ICT Teacher-ICT Teacher-ICT Teacher-ICT	4-ICT Teachers	04
2	Students with visual impairment 24	6-SWVI with experiences in ICT.	06
<b>Total</b>			10

Source: Primary Data (2023)

### 3.5 Methods of data collection

Data was gathered through formal interviews, recorded using various methods such as note taking audio recordings. Coleman (2019) defines interviews as exchange of opinions that enhances knowledge generation and emphasize social context. Interviews involve direct interactions between the researcher and the respondent (interviewee), either in person or through virtual means. These interviews can be categorized as structured (with predetermined questions), semi-structured (combining predefined and open-ended questions), or unstructured (permitting open and spontaneous conversation). Interviews offer a comprehensive understanding and the opportunity to delve deeper into specific subjects through probing (Ranjan , 2022).

In addition, Jain (2021) stresses the advantages of interviews, including their flexibility for interviewers, higher response rates compared to mailed questions, accessibility for individuals who cannot read or write, and the ability to assess non-verbal behavior. Interviews also offer the advantage of selecting a private and quiet location, unlike email interviews which lack control over the environment.

However, Jain (2021) asserts that interviews may also have some disadvantages such as time consuming and that they may make interviewees not to respond freely, frankly and accurately due to fear. Interview was chosen for this study because it provides opportunity for in-depth one on one and face to face interaction when getting students experiences during ICT based instructions.

### **3.6 Data Collection Instruments**

Semi structured Interview guides were utilized for data collection. According to Creswell (2014) semi-structured interview guide is a tool for collecting data. It consists of a list of questions which are kept deliberately open-ended to provide cues for participants to talk with a minimum of interruptions and without judgments.

The researcher used interview guides to gather information from teachers and students at the secondary school, which assisted in gaining insights of students' experiences during ICT, based instruction which was in line with the objectives of the study.

### **3.7 Pilot study**

A pilot study is a small study conducted and attempts to identify issues or obstacles that may arise. This help in pretesting and retesting the study procedures or methods, the validity of study tools as well as enlistment or estimation of the sample size Ranjan , (2022). The researcher carried out a plot study in a similar secondary school with an annex for students with visual impairment in Eastern Uganda. The reason was to identify the strengths and weaknesses of the tools and see how to improve them. Four students with visual impairment who were not participants in the final data were used. They were selected within Madera school

for the blind. Strengths were more than the weaknesses the weaknesses were made right. After this the tools were approved. At the final data collection 6 students with visual impairment were used from one secondary school from Gulu City.

### **3.8 Data collection procedures**

These are steps and processes that researchers follow to gather data for the study. The procedures can exhibit variability contingent upon the design, methodology, and the characteristic of the data (Syed & Kabir, 2016).

The research procedures consist of several essential steps aimed at ensuring ethical and precise data collection. Initially, the researcher secured a letter of introduction from the Directorate of Graduate Studies, enabling permission to collect data from the chosen school. Prior to main data collection, a pilot test of the data collection instruments was conducted to identify and rectify any issues or ambiguities. Informed consent was sought from all participants, explaining research objectives, procedures, risks, and participant rights.

Throughout the data collection process, accuracy and reliability stood maintained by checking for errors and inconsistencies, and validation techniques were employed to cross-check data. Collected data were securely stored; with encryption methods used as needed to protect participant privacy. Ethical principles were upheld, ensuring participant confidentiality and conducting the research with integrity and respect for participants' rights. By following these steps, the research targeted at gathering valuable and trustworthy data while prioritizing ethical considerations.

### **3.9 Data Analysis**

This study used qualitative data analysis techniques specifically the use of thematic analysis technique. Thematic analysis involves identifying, analyzing and interpreting of data. The researcher reads through a data set example the transcripts from the interview guide and identify patterns in meaning across the data to derive themes and use the themes to address the research problem. This procedure involves six specific steps, including familiarizing oneself with the data, creating initial codes, recognizing emerging themes, reviewing these themes, defining and labeling the identified themes, and finally, compiling reports. This help the researcher to think critically, generate new knowledge and innovations (Dawadi, 2020). The researcher used thematic data analysis to summarize the data and to interpret it.

### **3.10 Credibility and trustworthiness**

Credibility and trustworthiness mean the qualities or disposition or criteria for judging how true, believable, credible, dependable or transferable the study results are in the face of not only the researcher but participants and the readers of the study as well (Creswell 2014).

The instruments were designed, discussed and certified together with my supervisors, considering the category of the participants.

The study put into consideration credibility and trustworthiness of the data control. The researcher carried out a pretesting of tools through a pilot study in a similar secondary school in Eastern Uganda.

### **3.11 Ethical considerations**

Participants were informed of the study purpose; interval and how the data attained were going to be kept and used. During collection of data, extreme confidentiality was observed. The spirit of anonymity remained highly considered and the participants' identity was in no way revealed.

The researcher also asked for participant's informed consent before carrying out any activity while in the field.

### **3.12 Delimitations and limitations of the study**

In the process of carrying out the study, there were delimitations and limitations encountered as explained below:

#### **Delimitations**

The language was not a problem to me since all the participants were using English. This made data collection process easy since all participants interpreted the questions well and gave their answers accordingly.

- ❖ The idea of interviewing all the participants selected materialized and all the ten participants participated willingly.
- ❖ Administering semi-structured interview guides to the participants, stimulated spontaneous interaction with them for acquaintance and adaptation.
- ❖ I reside within Gulu City therefore the security situation was safe and movement to the school of study was easy.

#### **Limitations**

- ❖ At the time of conducting the research, there was a very strong heat wave in the Northern region especially in Gulu City. It was really difficult to

carry out the interview which was scheduled only in the afternoon. The researcher allowed the participants to change venues and to have breaks for taking water during the interview sessions.

- ❖ The fact that the researcher was from the Primary teachers' college within Gulu City, some participants suspected the researcher of having a link with the ministry. Thus, they were very much concern about the leakage of school information. The researcher informed them that she was also a special needs tutor in the college and that she was examining the experiences of students during ICT based instruction and how the students were utilizing the devices available.
- ❖ Finally, financial constraints hampered some video recordings during the interview hence the researcher relied mainly on note taking and on audio recordings.

**CHAPTER FOUR**  
**PRESENTATION, INTERPRETATION AND DISCUSSION OF**  
**FINDINGS**

**4.0 Introduction**

This chapter covered presentation, interpretation and discussion of findings of the study which sought to examine whether students with visual impairment benefits from online instruction to investigate the experiences of students with visual impairment on notes given in soft copy and establish the ways in which these students use the audio devices. The presentation, interpretation and discussions have been sectioned according to the objectives of the study mentioned above.

**4.1 Demographics of participants**

The school of study is an inclusive secondary school with a total population of 700,000 students and 23 teachers constituting 24 students with visual impairment representing 4% of the total enrolment, 9 are female and 15 are male representing a ratio of approximately 38% and 62% for female and male respectively. In this study, data was collected from a sample comprising four teachers from the department of special needs and six students with visual impairments, whose perspectives offered valuable insights into the experiences of students with visual impairment in relations to ICT. Below is a detailed breakdown of the participants' demographics:

**Table 4.1: The demographics data of participants**

<b>Characteristics</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>	<b>P6</b>	<b>P7</b>	<b>P8</b>	<b>P9</b>	<b>P10</b>
<b>Occupation</b>	Tr.	Tr.	Tr.	Tr.	SWVI	SWVI	SWVI	SWVI	SWVI	SWVI
<b>Age</b>	30-35	35-40	30-35	35-40	13-15	13-15	13-15	18-20	15-17	18-20
<b>Gender</b>	M	M	F	M	F	M	M	F	F	F
<b>Disability</b>	Sighted	Blind	Sighted	LVI	SWLV	SWLV	SWVI	SWLV	SWVI	SWVI
<b>Educational level</b>	Bachelors	Bachelor s	Bachelors	Bachelors	S2	S2	S 3	S 3	S 4	S 4
<b>Experiences with ICT</b>	Proficient MS word, internet browsing and screen reader with MS office and screen reader and internet	Yes	Yes	Yes						

The table above provides the codes assigned to all participants. Letter P for participants 1-10 and also details of each participant's characteristics, including their roles as either teachers or students, age, educational level, gender, and their respective experiences with ICT.

The demographic profile of participants in this study sheds light on the varied composition of students with visual impairments. As shall be later seen, each student's level of education, and level of sight loss contributed uniquely to their engagement with ICT tools. For instance, students in senior 2 demonstrated differing levels of proficiency compared to those in senior 3, indicating a developmental trajectory in ICT skills acquisition.

Furthermore, students with low vision (SWLV) exhibited adaptive strategies, such as alternating between screen readers and functional vision to mitigate eye strain, featuring the dynamic nature of their ICT usage. These nuanced differences emphasize the need for personalized support and tailored interventions to address the diverse learning needs of students with visual impairments effectively.

Moreover, the demographic diversity observed underlines the imperative for inclusive educational practices that prioritize accessibility and equity. By recognizing the complex experiences of learners with visual impairments, teachers and policymakers can better design inclusive learning environments that empower every learner to thrive.

Through targeted interventions and specialized ICT tools, such as screen readers and audio devices, barriers to learning can be mitigated, enabling learners with visual impairments to participate fully and meaningfully in educational activities. Embracing this diversity not only fosters a more inclusive educational landscape

but also cultivates a culture of empathy, understanding, and support for learners of all abilities.

In conclusion, the demographic characteristics of participants highlight the complex interplay between individual attributes and ICT utilization among learners with visual impairments. By acknowledging and addressing these distinctions, stakeholders can work towards creating an inclusive educational ecosystem where every student has the opportunity to succeed. Through collaborative efforts and a commitment to accessibility, the potential of students with visual impairments can be unlocked, paving the way for a more equitable and inclusive future in education.

#### **4.2 Whether students with Visual impairment benefit from online instruction**

This theme has been presented in four subthemes and these are; students' awareness of online tools for conducting lessons, students' ability to use online tools while studying, students perceived benefits of online lessons and challenges faced in using online platforms.

##### **4.1.1 Students' Awareness of Online Tools for Conducting Lessons**

The students demonstrated varying levels of awareness regarding online tools for conducting lessons. The participants were asked on their awareness of different tools and platforms for conducting lessons and responses ranged from not having heard of any, to having used some online platforms either once or many times. The online platform put to them were Zoom, Google Meet, Microsoft Teams, YouTube or any accustomed platform.

P5 for example mentioned attending online lessons during the lockdown season, indicating awareness of online platforms such as YouTube for educational purposes. Still, this participant was unable to identify the specific organizers of

these lessons, suggesting a limited understanding of the platforms' administrative aspects. Due to limited vision, the participant could not read small labels and branding information associated with the class and so failed to make out who the organizers were.

In the particular instance, all the time the participant attended this class; required the help of their mother who had to attend to home chores before connecting her, so introductions were already done. This crucially indicates the need for supporting learners to independently operate different online tools and other ICT equipment should be treated with concern.

In another occurrence, another participant, P9, admitted of having attended a class on Google Meet, nevertheless they were not aware of how the platform worked as they were also supported by another older but sighted student.

In total, 4 of the participants were aware of at least one platform for conducting online classes or training, 2 of the six students had used YouTube and Google meet while 2 had not heard of any of the tools at all. These findings indicated that on average the students who participated in the study knew about online platform but only few had used either YouTube or Google meet while others had not heard about it at all.

#### **4.1.2 Students Ability to Use online tools while studying**

While some students expressed familiarity with attending online lessons, it became evident that all of them faced challenges in connecting their devices to the lessons

or interacting with the interface of the platforms. Even for the two participants who had ever used Google Meet and YouTube, they still required assistance from fully sighted individuals to establish connections. In one occasion, a participant's mother provided support but could only connect her after parts of the lesson had already passed, indicating a lack of focus on training students to independently navigate video conferencing platforms or streaming platforms like YouTube, which are essential tools for remote learning.

In the case of the participant who had experience with Google Meet, significant challenges arose when attempting to adjust the audio volume and utilize features like the 'raise hand' function to communicate with the teacher. Participant P9 noted:

The teachers' voice was very low, but I couldn't ask him to increase the volume. I initially thought there was an issue with my computer. I nearly gave up until I borrowed some headphones, which improved my ability to hear.

This scenario points out the learner's inability to effectively utilize the platform due to a lack of familiarity with how to increase the volume.

The teachers involved in the study acknowledged that they had not made any concerted efforts to instruct the students on how to utilize video conferencing or streaming platforms. One participant (p2) said:

"I myself am not yet very good with Zoom and those platforms. And also, our internet has not been good this side.

This statement confirms both the teachers' own limitations in adapting to these technologies and the external challenges posed by unreliable internet connectivity. Significantly, this teacher was also visually impaired, accentuating the inherent challenges encountered by both teachers and students. The design of most platform

interfaces poses difficulties for individuals with blindness or visual impairments, perpetuating a problematic cycle. When teachers themselves struggle to master these platforms, it becomes exceedingly challenging for them to provide adequate assistance to visually impaired students.

#### **4.1.3 Students perceived benefits of Online Lessons**

Participants recognized several benefits associated with attending online lessons. Some participants felt that attending online lessons offered them a better learning experience since they could see the teacher up close and follow screen presentations with greater clarity. This contrasted with the challenges they faced in a physical classroom setting, where their limited vision often hindered their ability to see what the teacher was doing on the chalkboard.

As P5 who is low vision noted, "It was good because I was able to look at the screen up close, which is different from when the teacher is teaching and you cannot see what he is doing on the chalkboard.

Being able to follow what the teacher is doing and presenting is a crucial component of the students' experience. The fact that some students with low vision felt they could follow classroom proceedings on a screen better than they could in a physical class is significant. This suggests that efforts to enable these learners to learn and use online training platforms should be treated with importance. It also strongly matches the fact that every student may have unique needs, and solutions to address these needs may arise from unexpected sources. This insight emphasizes the necessity of tailoring educational approaches to accommodate diverse learning styles and abilities of students with visual impairment.

Some students also brought out the scarcity of special needs experts as a significant challenge that could potentially be addressed through online learning. They

expressed frustration that while their peers without disabilities can access support from teachers and family members when they return home, they face difficulties in finding experts who truly understand their unique needs. This lack of specialized support during holidays and breaks aggravates their educational challenges. Therefore, utilizing online learning platforms could serve as a means to ensure continuous access to their teachers of special needs, even when they are away from school.

As P7 stated,

“Our peers can find teachers even in the villages, but for us, when we go home; we have no support because our family members cannot help with our education.

“They don’t understand how we learn, for example, mathematics.”

Another participant, P6, stated,

“Online classes are so nice because with visual impairment, they're very few people who can cater for me and my unique needs. And they are also very far. at least if you have access to online tools for teaching, then the teachers who have knowledge of handling students like us can support us even when we are far away.”

”

The findings above show students’ motivation to use online instruction to gain knowledge from ICT maximally even in the absence of experts. Something which has encouraged many students with visual impairment to remain in school unlike the past when they did not enjoy studies and some could drop out due to lack of motivation in learning.

The sentiment below was echoed by a teacher who participated in the study, who emphasized the significant advantages of being able to support students during holidays or school breaks. He stressed the importance of continuous engagement, particularly for students in their early years of secondary education. One teacher, P4 articulated this need by stating,

“The ideal would be to continue working with these students even when they go home, especially the ones in senior one. They need a lot of support. And you can see that there are so many lessons on TV for sighted students, so if we just leave our learners out there it is not good because the reason they conduct those lessons on TV is because they know students must be kept occupied even when they are at home, you know the idle mind is the ... you know the saying.”

This features the importance of using technology to bridge the gap in access to specialized support and resources for learners with disabilities, particularly during periods when traditional provision structures may not be readily available.

#### **4.1.4 Challenges faced in using online platforms**

Despite the benefits, students also faced challenges with online instructions and online platforms. They included the following:

One of the most common challenges is the limitation in being able to control the User interface of the devices. All the six students admitted to having no knowledge of how to connect their computers to Google meet, Zoom or any other platform for interactive conferencing. All the students who had ever used the platforms YouTube and Google meet admitted to getting support from either their parents or their older sighted peers. As P5 noted,

“It was my mum who helped me to get connected all the time. And sometimes she had to first complete her house work before she comes to

connect me and by the time she comes, the lesson is already ongoing and I have missed a lot”

Despite the advantages, students encountered several challenges when engaging with online instruction platforms. These challenges included limitations in controlling the user interface of their devices, particularly when attempting to connect to platforms such as Google Meet or Zoom for interactive conferencing. All the six students expressed lack of knowledge regarding this process, relying on assistance from either their parents or older sighted peers. P10 recounted,

“It was my mum who helped me get connected every time. Sometimes she had to finish her household tasks before assisting me, causing me to miss part of the lesson.”

This dependency on external support underscores the barriers faced by students with visual impairments in independently accessing online educational resources.

Furthermore, students struggled with navigating the interface of online conferencing platforms, hindering their ability to engage in real-time interactions.

P7 shared,

“It was some boy in senior six who helped me to get connected. And he was also doing his own things, so when I faced challenges and I called him, he kept asking me to wait, and yet the lesson was going on. At one time I wanted to raise my hand and ask the teacher and by the time this senior 6 student came, the teacher had already moved to another topic.

The above narratives illustrate the additional struggles faced by visually impaired students in effectively participating in online classes, emphasizing the need for improved accessibility and tailored support mechanisms to address these challenges.

In addition to the challenges with user interfaces and real-time interaction, students with visual impairment also faced limited access to reliable internet connectivity, further hindering their ability to engage effectively with online instruction. The school relied on internet provided by a non-governmental organization, which abruptly ceased funding for the special needs department just before the onset of the COVID-19 pandemic. Consequently, the school has been grappling with unreliable internet access since 2019, with only small bandwidth packages available for basic computer updates. As P2 lamented,

“We would have struggled to first of all teach ourselves how to use Zoom and those other platforms, and then maybe teach the learners, but we don’t have internet here. Since 2019, we have not had reliable internet. We just get small bandwidth packages for updating the computers only.”

This features the significant impact of inadequate infrastructure on the ability of both teachers and students to fully utilize online learning resources, highlighting the urgent need for improved internet access in educational settings catering for visually impaired students.

The study delved into the experiences of students with visual impairments in navigating online training platforms, revealing a nuanced landscape of benefits and challenges. Despite the potential advantages offered by online instruction, such as improved access to educational resources and enhanced interaction with teachers, students encountered various obstacles that hindered their effective engagement with these platforms.

One significant barrier was the students' limited proficiency in controlling user interfaces, as highlighted by their reliance on external assistance to connect to online conferencing platforms like Zoom and Google Meet. This dependency on

others not only delayed their access to lessons but also impeded their real-time interaction during sessions, as students struggled to navigate the interfaces independently.

Moreover, the study uncovered issues related to internet connectivity, with students expressing frustration over the school's unreliable internet access. The abrupt termination of funding for the special needs department's internet connection worsened the challenge, leaving teachers and students equally grappling with recurrent access to online resources. This limitation not only hampered learners' ability to participate fully in online training but also emphasized broader infrastructure deficiencies in educational settings catering to visually impaired students.

Despite these challenges, participants acknowledged the potential of online instruction to bridge geographical barriers and provide continued support during school breaks, highlighting the importance of addressing accessibility issues to ensure equitable learning opportunities for all learners.

In conclusion, the study shed light on the multidimensional experiences of learners with visual impairments in navigating online training platforms, revealing both the potential benefits and significant challenges associated with these technologies. By identifying barriers such as limited proficiency in user interfaces and inadequate internet connectivity, the study stressed the urgent need for targeted interventions to enhance accessibility and support for visually impaired students in online educational settings. Addressing these challenges is crucial for promoting inclusive education and ensuring that all learners, regardless of visual ability, can fully participate and thrive in the digital learning environment.

#### **4.4.5 Benefits of online instruction to students with visual impairment**

The findings of the study exposed that the teaching of ICT to students with visual impairment is vital and fundamental in access to information, concepts and materials online, which may be challenging through traditional methods like reading books in the library. The appropriate technology with the features which embedded altogether in ICT makes it easier for visually impaired to access the necessary and required information for and during learning.

This put emphasis on what Amponsah & Bekele, (2023) observed that online learning has improving access to the quality of education for students with visual impairment and is also considered as a strategy for contributing to the UNSDG 4 equal and equitable life long education for all by 2030.

Online learning was simple because it helps these students to explore and also discover things on their own.

“I get practical skills like typing and knowledge. You learn two things at a go theory and practical”.

This study uncovered that there are numerous benefits associated with online training for students with visual impairment. Among which include reducing barriers between students and special support, addressing difficulties associated with visual challenges that limited learners from observing teachers on the chalkboard, among others. Relatively Kisanga & Kisanga, (2022) confirmed that online instruction enables students with visual impairment to become active learners in the classroom alongside their peers who do not have disabilities. It also expands the learning environment beyond the walls of the classroom and allows access and sends information literally around the world.

One of the notable benefits noted by participants was the engaging learning experiences, particularly for those with low vision. The quality of students' learning experiences is paramount for their sustained involvement in the teaching-and-learning process. Traditional classroom settings often pose challenges for learners with impairment to fully participate during the teaching.

However, technology introduces alternative teaching methods that can enhance engagement to overcome barriers associated with impairment and traditional teaching approaches. Earlier in chapter 2, Madina-Gracia et al., (2021) suggested that online teaching methods offer new learning opportunities and foster greater interactivity, thus making learning more attractive for students with visual impairment. This finding aligns with the observations of Madina-Gracia et al., (2021), which suggest that technology plays a crucial role in overcoming educational barriers and enhancing the learning experiences of students with impairment. Therefore, it is important to boost technology so as to update instruction and learning approaches which are essential for promoting inclusive education and addressing the diverse needs of students with visual impairment.

Previous research, such as that of Kelly (2023), had also noted that online instruction offers personalized learning experiences, catering to the various needs of students with disabilities, which aligns with the findings of this study which advocate for reducing barriers to access and individualized support for students with visual impairments in online instruction.

Despite the benefits, the study also revealed challenges faced by students with visual impairments in navigating online platforms. One significant challenge

highlighted in the study is the difficulty in controlling the interface of online platforms, which can impede students' ability to fully use the learning materials.

Doush et al., (2022), defines desktop video conferencing as software that facilitates multi-channel communication, enabling users to connect one-on-one, in groups, or across multiple groups. Such systems provide an interactive experience akin to face-to-face communication, bridging geographical gaps through virtual meetings.

On the other hand, it's crucial to note, as spotted by Doush et al., (2022), that most video conferencing interfaces are visually oriented, posing challenges for visually impaired users. Even with the assistance of screen readers, effective use of these tools requires thoughtful consideration of interface design to ensure accessibility. Therefore, rigorous and deliberate support is imperative for learners with vision impairment to have positive experiences with online platforms, and this is very consistent with the findings of this study.

Furthermore, the study findings emphasize the importance of addressing these challenges to ensure equitable access to online instruction for students with visual impairments. Interventions such as providing training and technical support for students and educators on using accessible online platforms, as well as incorporating universal design principles into the development of online educational materials, could help mitigate the barriers identified. Burgstahler, (2015) has advocated for similar approaches to enhance accessibility in online education, emphasizing the need for ongoing research and collaboration between educators, technologists, and disability advocates to advance inclusive practices.

One of the most unsettling revelations was made by a teacher who expressed their own lack of proficiency with online platforms. This admission indicates a broader issue prevalent in teacher training and special needs education in Uganda: lack of concerted efforts to equip educators with the necessary skills to leverage digital platforms such as Zoom for classroom purposes. In many educational systems worldwide, the rapid advancement of technology often overtakes the integration of these tools into pedagogical practices.

This is similar with what Doush et al., (2023) observed that during the COVID-19 pandemic, many educational institutions transitioned to online instruction via video conferencing tools. To support the learning of students with visual impairment, accessible tools were implemented, incorporating inclusive features such as applications tracking students' participation by counting messages sent, hands raised, and speaking instances.

Despite the increasing prevalence of digital tools in modern classrooms, teachers are still lagging behind in providing comprehensive instruction on incorporating technology to support different learning needs of students with visual impairment.

In the study of Comi et al., (2017) as discussed in chapter 2, while online teaching methods improves the student's communication, which calls for their active participation in ICT-enhanced classrooms, the teachers' practical incorporation of ICT is contingent upon their ability to effectively integrate it into their teaching strategies.

The disparity between technological developments and educational practices is not unique to Uganda or the United States; it is a global phenomenon. In countries such as Finland and Singapore, where educational systems are renowned for their

innovation and excellence, efforts to integrate technology into special education have also encountered challenges. For example, a study by Li & Wong, (2021) found that while Finnish educators recognized the potential of digital platforms to enhance inclusive education, many lacked the necessary training and support to effectively implement these tools in their classrooms.

On the other hand, Eligi & Mwantimwa, (2017) observed that even though the resources are available, there persist several obstacles in terms of utilizing and obtaining ICT resources.

These findings encourage the urgent need for educational institutions, particularly those involved in teacher training and special needs education, to prioritize digital literacy and technology integration initiatives. Investing in professional development programs that equip teachers with the skills and knowledge needed to harness the full potential of online platforms that can facilitate more inclusive and effective instructional practices.

Moreover, fostering collaboration between educators, technology specialists, and policymakers is essential for developing comprehensive strategies to address the evolving needs of students with disabilities in an increasingly digital world. By bridging the gap between technological advancements and educational practices, countries can ensure that all students, including those with special needs, have equitable access to quality education opportunities.

This study also reinforced the role of parents in supporting or facilitating access to online platforms, and special needs education broadly. The role of parents in supporting special needs education, particularly for learners with visual impairment, is crucial yet often overlooked. This was cited by Khan and Mahmood,

(2022) who emphasized the need of collaborative efforts between teachers and other stakeholders. As evidenced by the participant's experience in this study, parental involvement can significantly impact the educational outcomes of students with visual impairment.

However, it is essential to recognize the intricate challenges that parents of learners with visual impairment may face in providing adequate support. For instance, the participant mentioned that her mother, despite being instrumental in facilitating her access to educational resources online, often had to prioritize household chores before attending to her educational needs. This marks the complex balance that parents of students with disabilities must navigate between caregiving responsibilities and supporting their child's education.

The study findings supported that parental involvement plays a pivotal role in the academic success and well-being of students with disabilities. According to Malik, (2023) parental engagement in their child's education positively correlates with academic achievement, self-esteem, and social-emotional development, particularly for students with disabilities. However, barriers such as time constraints, financial limitations, and lack of access to resources can impede parents' ability to actively participate in their child's educational journey, as documented by Blacher & Baker, (2019).

Furthermore, the experiences of parents of students with disabilities are often characterized by feelings of isolation, stress, and uncertainty about how best to support their child's unique needs. This confirms the discovery of Vashistha et al., (2015) who noted that students with visual impairment who live in low-income

families experience a range of educational difficulties that are worsened in developing countries. Students generally lack access to digital assistive equipment.

In light of these challenges, it is imperative for educational institutions and policymakers to recognize the pivotal role of parents in supporting special needs education and to implement initiatives that facilitate parental involvement and empowerment. This may include providing training and guidance to parents on how to navigate educational systems, access assistive technologies, and advocate for their child's educational needs. By fostering strong partnerships between parents, educators, and relevant stakeholders, we can create a more inclusive and supportive learning environment for students with visual impairment and other disabilities.

In summary, the study deepens the potential of online training to address barriers to education for students with visual impairment, offering benefits such as enhanced access to specialized support and mitigating challenges associated with visual limitations in traditional classroom settings. However, participants veined persistent difficulties in navigating online platforms, particularly in controlling interface elements, reflecting a broader gap in proficiency with digital technologies among educators and students alike.

This points to the critical need for targeted teacher training programs to improve educators' capacity to influence online platforms effectively for inclusive education, ensuring that students with visual impairment can fully access and benefit from digital learning opportunities. The role of parents in supporting and facilitating access has also been highlighted. Besides, the broader challenges of

technology and access, which will require broader collaboration between users with disabilities as well as developers.

## **4.2 The experiences of students with visual impairment on notes given in soft copy**

One of the objectives of this study was to examine how students with visual impairment benefit from notes given to them in soft copy. To establish this, the study asked students on Utilization, frequency, storage, benefits, challenges and other opportunities that use soft copy class notes offered to them.

### **4.2.1 Utilization of soft copy notes**

All the students who participated in the study acknowledged utilizing soft copy notes on a daily basis as integral components of their learning routine. The consistent use of digital resources emphasizes their significance in facilitating access to educational content among students with visual impairments. This daily engagement with digital materials reflects the students' reliance on technology-enhanced resources to support their academic endeavors and overcome barriers associated with traditional printed materials.

Moreover, the preference for soft copy notes and learning materials over brailled counterparts emerged as a prevalent trend among the participants. One student highlighted the challenges associated with reading braille, particularly in difficult environmental conditions such as cold weather. The participant explained,

"Actually, for me, I can even struggle with reading Braille because sometimes when it is too cold, my hands cannot read very well. Like when it's cold, the dots start appearing differently, and sometimes the dots become faint. I find that braille books actually get spoiled very quickly."

This increases the practical challenges students face when accessing brailled materials, including issues related to readability, durability, and environmental factors. The preference for soft copy notes aligns with the students' desire for convenience, reliability, and adaptability in their learning resources. By opting for soft copy notes, students feel that they can mitigate the limitations associated with braille while accessing content in a format that offers greater flexibility and ease of use. Thus, the frequency of use and preference for soft copy notes signify their apparent important role in supporting the learning needs and inclination of students with visual impairments at least for the case of this school.

#### **4.2.2 Types of learning materials availed in soft copy**

At the school of study, all learning materials are provided in soft copy, except for Mathematics. Soft copy learning materials are distributed in three main formats: PDF (portable document format), Microsoft Word or Docx formats and RTF (Rich text formats). The main materials provided in these formats are; class notes, textbook excerpts, and supplementary resources.

Class notes are delivered by the subject teachers, and they are typed up by support personnel within the special needs department based on the teacher's instructions. Once typed, these notes are digitized and shared with students to supplement their learning during lessons.

Textbook excerpts are selected by subject teachers to complement classroom instruction. Support personnel scan the specified pages from textbooks and convert them into digital formats, ensuring that students have access to relevant content aligned with the curriculum.

Supplementary resources, including full textbooks, novels and plays, are also made available in digital formats to enhance the educational experiences for students with visual impairment. The digitized textbooks, plays and novels are done with recommendation of subject teachers. As one teacher, P2 explained,

“At the start of the year we ask the subject teachers in all the classes to provide us with the list of books they want us to scan, then we either go to the library or get those books, or we go to our neighboring schools and look for the books if the school library does not have them. Then we make them available in soft copy for the students not only in that class but for all the learners because sometimes a student in senior 3 might want something from the books of senior twos...”

Despite the comprehensive provision of soft copy learning materials, mathematics textbooks remain unavailable in digital formats. As one teacher, p2 explained,

“Mathematics is the biggest thorn in our flesh here, because you can’t just scan the book for mathematics and give a learner to listen, it has to be specially adapted, and we can’t do that special adaptation. Also, mathematics cannot be learned by listening only, it has to be interacted with either by seeing or by touching”.

Overall, the availability of soft copy learning materials underscores this School's current style to learning materials provision, wanting to influence technology to the best extent possible in resource availability. This is also the modern paradigm of inclusive education where technology is used to break down barriers and bridge gaps in the education of students with visual impairment.

However, there are limitations faced by the school and the teachers especially in relations to availing mathematics textbooks in digital formats. This is due to the limited knowledge on how to adapt mathematics textbooks and extract in digital formats. This shows the need to develop capacity of teachers to adapt technology

to ease studying of subjects such as mathematics and sciences for students with visual impairment in secondary schools.

#### **4.2.3 Technologies used to utilize soft copy materials**

All the 6 students who participated in the study acknowledged utilizing 4 devices to access soft copy notes Computer, Victor stream reader, Plex Talk, Blaze ET and Orbit Reader 20.

The Victor Reader Stream is a portable audio book player designed primarily for individuals with visual impairments.

It allows users to access and listen to digital audio content, including books, newspapers, and music, in various accessible formats. The device also features navigation controls and bookmarking functionality for ease of use.

Human Ware, a Canadian company, is the manufacturer of the Victor Reader Stream. The company is headquartered in Drummondville, Quebec, Canada. The first version of the Victor Reader Stream was released in 2007, marking the beginning of its innovative contributions to accessible technology (Singh & Gupta , 2022) .

The Victor Reader Stream is a portable audio book player designed primarily for individuals with visual impairments. It allows users to access and listen to digital audio content, including books, newspapers, and music, in various accessible formats. The device also features navigation controls and bookmarking functionality for ease of use. Human Ware, a Canadian company, is the manufacturer of the Victor Reader Stream. The company is headquartered in Drummondville, Quebec, Canada. The first version of the Victor Reader Stream

was released in 2007, marking the beginning of its innovative contributions to accessible technology (Singh & Gupta , 2022).

Plex talk is a specialized audio book player designed primarily for individuals with visual impairments. It provides users with access to digital talking books in the DAISY format, offering a user-friendly and accessible reading experience. Shinano Kenshi Co., Ltd., a Japanese company, manufactures Plex talk. The company was established in 1918 and is headquartered in Nagano, Japan. Plex talk devices have been available since the 1990s, with continuous advancements in technology to meet the evolving needs of users with visual impairments (Singh & Gupta 2022).

The Blaze ET is a multifunctional handheld device designed to support individuals with visual impairments in accessing digital content and performing various tasks. It integrates features such as a digital audio book player, media player, OCR (Optical Character Recognition) scanner, and note-taking capabilities. HIMS Inc., an American company, is the manufacturer of the Blaze ET. The company is headquartered in Austin, Texas, United States. (HIMS Inc., N.D).

The Orbit Reader 20 on the other hand is a portable refreshable braille display designed to provide access to digital content for individuals with visual impairments. It features 20 refreshable braille cells, allowing users to read braille books electronically, but in a way that mimics braille printed on a paper. The device also includes a Perkins-style braille keyboard for input and navigation, allowing users to take notes in braille the same way they would braille on Perkins Braille.

The Orbit Reader 20 is manufactured by Orbit Research, an American company specializing in assistive technology solutions for people with disabilities. Orbit

Research is headquartered in Wilmington, Massachusetts, United States. The first version of the Orbit Reader 20 was released in 2018, offering an affordable and compact braille display option for users worldwide (Orbit Research, 2022).

In this school, digital materials are provided in Microsoft Word format for compatibility with Victor Stream Reader, Plex talk, and Blaze devices, as well as computers. Additionally, materials are available in electronic Braille format, suitable for refreshable Braille displays like the Orbit Reader 20.

Students utilize the speech capabilities of e-readers such as Plex talk and Victor Stream Reader to have the softcopy notes or textbooks read aloud. For computer-based access, screen readers like JAWS are employed to provide auditory output. Even those with functional vision often opt for screen readers over visual reading due to issues such as eye strain. As P8 explained,

"I have eye pain if I read with my eyes for a long time, so I prefer to use JAWS."

This comment emphasizes the importance of customizing access arrangements based on the comfort and medical needs of each student. It highlights the necessity of assessing a learner's comfort level with a specific mode of access, particularly when utilizing technology, to ensure a positive experience.

#### **4.2.4 Students perceived experiences of using soft copy notes and learning materials**

The students with visual impairment in the school of study cited numerous experiences associated with using soft copy notes and learning materials among, challenges associated with using soft copy notes and other learning materials which included the following:

One significant advantage highlighted by the participants is the enhanced accessibility and flexibility offered by digital formats. Learners expressed appreciation for the ability to access materials on electronic devices such as e-readers and computers, which allowed them to read and study at their convenience. For instance, one participant remarked,

"I like using my Victor Stream Reader because I can carry it everywhere and study whenever I want, even in my bed, where I can't enter with a braille book; you just lie there with your headphones and keep revising from there."

Additionally, students noted the ease of navigation and search functionalities available in digital formats, which facilitated quick access to specific sections or topics within the materials. Another participant emphasized,

"With Plex talk, I can easily navigate through the chapters of my textbooks and find the information I need without searching through touch which is slow for me."

Learners also highlighted the portability and durability of electronic or soft copy materials compared to traditional braille materials, reducing the need to carry heavy books and minimizing wear and tear.

Overall, students perceived using soft copy notes and learning materials as advantageous due to the convenience, accessibility, and functionality offered by digital formats.

#### **4.2.5 Challenges associated with using soft copy notes and other learning materials**

In exploring the challenges encountered by students in utilizing soft copy notes and learning materials, several notable obstacles emerged. Firstly, students faced the problem of limited access to reading devices. As one participant lamented,

"I don't have my own e-reader, so I rely on the school's computers which are often occupied. Sometimes you go to read and another person is still reading; now when he says he is done; you don't feel like reading anymore because the morale is gone"

This dependence on shared resources hindered consistent access to digital materials, impacting the learners' ability to study effectively.

Another significant challenge highlighted by participants was the risk of computer viruses and malware affecting their electronic devices. Due to the communal nature of school computers and shared storage devices, learners expressed concerns about accidentally downloading harmful software or losing their files to viruses. One student recounted,

"Last term, our computer lab was infected with a virus, and I lost all my study notes. It was frustrating."

Students also expressed the difficulty in understanding the text to speech voices built in to the reading devices. Both screen readers like JAWS and e-reading devices like Plex talk and Victor Reader utilize text to speech software systems. Text-to-speech (TTS) systems convert written text into spoken language, enabling users to listen to electronic text. These systems analyze text structure and content, apply linguistic rules to interpret meaning, and synthesize speech output using natural-sounding voices. Components include text analysis, linguistic processing, and speech synthesis. TTS methods vary from pre-recorded segments to real-time synthesis, with advancements in machine learning enhancing voice naturalness and expressiveness (Huang et al., 2018).

The challenge with synthetic speech is that as they mimic natural human speech, they still struggle with speech patterns such as intonation, natural pauses, rhythm, and emphasis, which are essential components of human speech (Widyana et al., 2022).

Widyana et al. also noted that when it comes to accents, text-to-speech (TTS) systems may face challenges in accurately reproducing regional or foreign accents. These systems are typically trained on standard pronunciation patterns and may struggle to interpret and reproduce variations in accent, leading to unnatural or robotic-sounding speech, and sometimes miss-pronouncing words that are foreign to the English language for examples names of places or people, and any other word foreign to the English vocabulary.

Users with non-English accents may find that TTS output does not accurately reflect their speech patterns, potentially impacting comprehension and user experience. As a result, achieving accurate accent representation remains a significant area of development for TTS technology. Many students and teachers who participated tinted that the screen readers and text-to-speech devices sometimes are difficult to understand as P3 explained,

“When students just start using soft-copy notes, remember they have to use JAWS, they sometimes struggle to understand what the software is saying”.

P8 explained,

“The accents of these computers are not easy to get sometimes, especially as an African. I wish there was a victor or Jaws that could speech English like a Ugandan”.

Additionally, institutional policies and restrictions posed obstacles to students' use of soft copy materials. The school of study prohibited students from taking electronic devices or storing digital files on personal devices, forcing students to leave their notes behind on school premises. As a result, students expressed frustration with the inability to study outside of school hours and during holidays.

Furthermore, students encountered accessibility issues with certain digital formats, particularly for visually impaired students who rely on screen readers or braille displays. Inadequate formatting and compatibility issues hindered the effective use of assistive technologies, limiting the students' ability to access and navigate the materials independently. As P5 remarked,

"Some of the digital textbooks are not properly formatted for my screen reader, making it difficult to read and understand the content."

Generally, students with visual impairment faced various challenges in utilizing soft copy notes and learning materials, ranging from technological limitations and security concerns to institutional policies and accessibility barriers. Addressing these challenges requires comprehensive strategies to enhance access, security, and usability of digital resources for all students with visual impairment.

#### **4.4.6 Experiences of soft-copy notes and digital learning materials**

This study also aimed to examine the experience of learners with visual impairments in relation to soft copy and digital learning materials. The study uncovered patterns of usage, reasons for preference, benefits, as well as associated challenges. In this chapter, discussions related to the adoption of digital learning materials for students with visual impairments will be presented.

The adoption of digital learning materials, including soft copy notes, offers several benefits for students with visual. One significant advantage is the elimination of the bulk associated with carrying braille books. Many learners find it cumbersome to carry multiple braille books, which can be heavy and impractical, especially in school environments. By utilizing digital materials, life has become easier for students with visual impairment in schools. There are various soft wares and tools. These help students with visual impairment to avoid bulky books (Haleem et al., 2022).

Digital learning materials also address the challenges associated with reading braille, particularly for learners who lost their sight later in life. Baker et al., (2019) revealed that the use of soft copy notes offers a variety of technology, including both common tools with accessible features on a wide range of assistive technology standalone Braille displays and note-takers. Some learners in this study expressed difficulties with reading braille due to their limited exposure or late-onset visual impairment while one student admitted of having additional impairment with the hands hence could not read braille especially when it was cold. Use of soft copy note was of great help to these students.

This study also encountered participants who thought braille was no longer useful in the abundance of digital alternatives. The discussion surrounding the role of braille in the education of individuals with visual impairments is part of a broader conversation within the field of special education. This debate encompasses various aspects, including the comparison between Unified English Braille (UEB) and Standard English braille, as well as the ongoing discourse on the relevance of braille versus digital alternatives such as soft copy materials.

However, there is also a growing perspective among some individuals with visual impairments that questions the necessity of braille in contemporary education. This viewpoint suggests that advancements in technology and the availability of digital learning materials render braille outdated. Advocates for digital alternatives argue that these technologies offer more efficient and versatile means of accessing educational content, particularly in the context of modern teaching methods and curricula.

This is useful to students when navigating accessible documents. It increases reading efficiency and reduce cognitive load (Singleton & Neuber, 2020). The emergence of this perspective reflects broader shifts in educational paradigms toward digitalization and the integration of assistive technologies into inclusive learning environments.

Nevertheless, the debate over the role of braille versus digital alternatives remains complex and multifaceted, with differing opinions reflecting individual preferences, educational philosophies, and practical considerations. While braille continues to hold significant value for many individuals with visual impairment, particularly in foundational literacy skills, the increasing accessibility and sophistication of digital technologies pose compelling alternatives that warrant careful consideration and ongoing research within the field of special education.

The challenge of teaching mathematics to students with visual impairments presents significant hurdles for educators, as highlighted by the findings of this study. The teachers emphasized that while they could extract many course materials in soft copy or digital format, they didn't know how to do the same for mathematics. Mackowski et al., (2023) in their study advised teachers to use audio-

tactile ability with graphic information during solving mathematical exercises in their teaching. This method uses a picture display on tablets with a tactile print and assumes to explore the elements of the picture by using descriptions at varying levels of details. Level of details is adjusted automatically based by the mistakes made by the students.

According to the study findings teachers frequently face difficulties in translating visual concepts and representations into accessible formats that can be systematically understood by learners with visual impairments in this school. The naturally visual nature of mathematical concepts, such as graphs, charts, and geometric shapes, poses particular challenges for students who depend on tactile or auditory modalities for learning.

However, the scarcity of specialized training and resources for teaching mathematics to students with visual impairments further compounds the challenge, as highlighted by teachers in this study. Without adequate support and professional development opportunities, teaches may struggle to effectively teach mathematics to students with visual impairments in vain. In the previous studies, Shoaib et al., (2023) recommended teachers to use My A + Math web-based prototype that facilitates learning by adding speech control and implementing an algorithm to solve problems hence enhancing basic skills in visually impaired students.

The study sheds light on the pivotal role of Text-to-Speech (TTS) technology in the education of individuals with visual impairments, particularly in the context of electronic reading devices like Victor Readers and Plex talks. TTS technology plays a crucial role in converting written text into spoken language, thereby enabling users to access and engage with digital content effectively. Screen reading

technologies, which utilize TTS, are integral to the accessibility of soft copy notes and digital learning materials for individuals with visual impairments, providing them with auditory access to textual information.

However, despite the widespread adoption of TTS technology, the suitability of accents in TTS voices remains a significant challenge, particularly for African users. Most TTS technology developers are based in Western countries, where accents and dialects differ significantly from those prevalent in African regions. As a result, TTS voices may not accurately represent the linguistic tones and accents of African users, potentially impacting comprehension and user experience. Research by Smith & Hattingh, (2020) revealed the importance of culturally and linguistically appropriate TTS voices for users from diverse backgrounds, emphasizing the need for greater representation and customization in TTS technology.

The study findings uncovered the challenge of accent suitability in TTS voices requires collaboration between technology developers, linguists, and users to ensure that TTS voices reflect the linguistic diversity and cultural tones of African languages and dialects. Ali, (2023) instructed teachers to adopt technology-driven intelligent system capable of transforming native languages into their corresponding braille forms and vice versa. Ali, (2023) further stated that this is the most effective technique for achieving language conversion through an Artificial Intelligence (AI).

By prioritizing the needs and preferences of African users in the design and implementation of TTS technology, developers can ensure that individuals with visual impairments have equitable access to digital content and educational

resources tailored to their linguistic and cultural backgrounds. The study sheds light on the pivotal role of Text-to-Speech (TTS) technology in the education of individuals with visual impairments, particularly in the context of electronic reading devices like Victor Readers and Plex talks.

TTS technology plays a crucial role in converting written text into spoken language, thereby enabling users to access and engage with digital content effectively. Screen reading technologies, which utilize TTS, are integral to the accessibility of soft copy notes and digital learning materials for individuals with visual impairments, providing them with auditory access to textual information.

Conversely, despite the widespread adoption of TTS technology, the suitability of accents in TTS voices remains a significant challenge, particularly for African users. Most TTS technology developers are based in Western countries, where accents and dialects differ significantly from those prevalent in African regions. As a result, TTS voices may not accurately represent the linguistic tones and accents of African users, potentially impacting comprehension and user experience.

Emphasis should be placed on the influential role of robust disability movements in mobilizing collective advocacy efforts. Governments and organizations committed to disability education and inclusion have made substantial investments in Text-to-Speech (TTS) technology, such as screen reading products and e-readers. It is imperative that these stakeholders control their consumer status to advocate for the consideration of linguistic and TTS needs, particularly in regions like Northern Uganda. By actively engaging with developers and manufacturers, disability movements can drive meaningful change and ensure that TTS

technology is inclusive and accessible to diverse linguistic and cultural communities.

#### **4.3 Ways in which students with visual impairment use audio devices**

This study also aimed to explore the advantages that students with visual impairment derive from using audio devices to enhance access to the teaching and learning process. To comprehensively understand this aspect, both learners and teachers were queried about various aspects related to the utilization of these devices. Specifically, the study investigated the frequency of use, types of devices employed, perceived benefits, as well as the challenges and opportunities arising from the use of audio devices.

By examining the frequency of use, the study sought to ascertain how often learners and teachers relied on audio devices as part of their educational activities. Understanding the types of devices utilized provided insights into the range of options available to facilitate audio-based learning. Moreover, exploring the experiences that offered valuable perspectives on the positive outcomes associated with the use of audio devices.

However, alongside the experiences, the study also aimed to identify the challenges encountered when utilizing audio devices.

##### **4.3.1 Utilization of audio devices**

In terms of utilization, all participants in the study consistently reported using audio devices on a daily basis as part of their educational schedules. The most commonly use of audio devices that was identified among students involved recording classroom proceedings and subsequently playing back the recordings at their convenience. This practice allowed them to revisit key lessons and instructions

outside of class time, enhancing their understanding and retention of course material. Furthermore, students with visual impairment frequently utilized audio devices for accessing audiobooks, including dramatized plays, novels, and other literary works. Notably, some learners accessed audiobooks from online platforms such as Librivox.org, which offers a vast collection of free public domain audiobooks recorded by volunteers worldwide.

Librivox.org serves as an invaluable resource for students with visual impairments, providing access to a diverse range of literary content in audio format (Abdu et al., 2020). This platform hosts a vast library of audiobooks spanning various genres and subjects, all of which are available for free download. Volunteers from around the globe contribute to the creation of these audiobooks by recording readings of public domain texts, ensuring that students have access to a rich array of educational and recreational materials. By accessing audiobooks from Librivox.org, students can explore a wide range of literary works, including classics, poetry, historical texts, and more, thereby enriching their learning experience beyond the confines of traditional printed materials.

In addition to recorded classroom content and audiobooks, students also utilized audio devices for alternative methods of note-taking. Some students with visual impairment enlisted the assistance of sighted peers to record class notes verbally, enabling them to access course content in audio format rather than relying solely on braille or printed materials. This practice reflects the adaptability and flexibility of audio devices in meeting the diverse needs of students with visual impairments, empowering them to engage with educational content in ways that best suit their individual learning preferences and abilities.

### **4.3.2 Types of audio devices used**

All the devices mentioned in part 4.3.1 (technologies used to utilize soft-copy materials) are also audio devices, with the exception of Orbit reader 20 which is a refreshable braille display.

The plex Talk, Victor reader and Blaze ET all have voice recording capabilities, audio book playback [capabilities and can play back text files in audio through its functionality covered in part 4.3.1.

On the other hand, Victor Reader is an audio book player designed to meet the needs of students with visual impairments. Developed by Human Ware, a company specializing in assistive technology solutions, Victor Reader offers support for various formats including DAISY, MP3, and other audio files (Human ware, 2019). Its user-friendly interface and versatile playback options make it a popular choice among visually impaired individuals seeking accessible reading solutions. Human Ware, headquartered in Canada, has been at the forefront of innovation in assistive technology for over three decades, providing products to enhance the lives of people with disabilities worldwide (Chaurasia & Singh, 2022)

All students demonstrated proficiency in computer applications, particularly Microsoft Word, and were familiar with portable reading devices such as Plex talk and Victor Stream Reader. These devices, tailored to the needs of individuals with visual impairments, played a crucial role in facilitating access to educational materials and promoting independent learning. Plex talk is a specialized audio book player primarily designed for individuals with visual impairments. Its intuitive interface and durable design make it a user-friendly option for those seeking accessible audio playback solutions (Alabi & Mutula, 2020).

### 4.3.3 Perceived uses of audio devices

The students with visual impairment and teachers who participated in the study identified numerous uses associated with audio devices. One of the most significant benefits was that audio devices allowed visually impaired students to cope up with teachers and classroom dynamics which were not so accommodative. Sometimes students used them for recording classroom proceedings and playing them back at their own convenience. This was particularly useful since not all the teachers employed at the school were deliberate about accommodating students with visual impairment.

Some teachers were too fast and did not bother to check if learners with special educational needs in their class were catching up with the speed of the lesson. Some teachers for example dictated notes much faster than students with low vision could cope with due to their limited vision and slow speed in writing. As explained by P10,

“I use it (audio device) almost all the time for example there's a teacher who teaches Christian religious education and that teacher is very fast and I cannot understand him so sometimes I have to just record his lesson, come back later and slow down the playback speed so I can follow it on my own now. For the reason that the teacher does not favor blind people so much. He can be dictating notes like he does not care that there are blind students who are also in that same class. He's very fast and he does not care to know about things that you are going through. Sometimes he writes the spelling of words on the chalkboard, because of my low vision I can't write very fast. That's why he really frustrates me.”

The narrative of this participant affirms the multidimensional role that audio devices play in the educational journey of visually impaired students. Beyond facilitating access to instructional content, these devices serve as a means of

empowerment, enabling students to assert control over their learning experiences. By recording and revisiting classroom lectures, students can overcome barriers imposed by teachers' teaching styles or classroom dynamics. In addition, the ability to adjust playback speed allows students with visual impairment to engage with content at a pace that suits their individual learning needs, mitigating the challenges posed by fast-paced instruction.

Furthermore, the participants' descriptions shed light on the broader issue of inclusivity within educational settings. The frustrations expressed by students with visual impairment highlight the importance of fostering environments that prioritize accessibility and accommodative teaching styles that cater for diverse learning needs. In this context, audio devices emerge as indispensable tools for promoting inclusivity and empowering students with visual impairments to participate fully in the educational process.

As teachers strive to create more inclusive learning environments, the insights gathered from this study underscore the pivotal role that audio devices play in realizing this goal. Through targeted interventions and support strategies, educational institutions can harness the potential of audio technology to foster a more equitable and inclusive educational experience for all students with visual impairment.

Students with visual impairment also emphasized the convenience of audio devices in reducing the need to carry bulky braille books. With the capacity to store numerous audio files in a single device, students can easily transport their study materials within the school premises. In addition, Abdu et al., (2020) emphasize that while learners with visual impairments prefer braille for subjects such as

mathematics, science, and music, where tactile interaction is essential, they opt for non-braille materials for other courses. The preference for non-braille materials is particularly pronounced among young visually impaired students at O-level, who cited the cumbersome nature of braille books as constraining to their adoption.

This is pretty consistent with this study. Many students echoed the sentiment that they favored audio devices loaded with audio books and notes over traditional braille books. For them, the convenience and accessibility offered by audio devices outweighed the tactile experience of braille. Audio devices allowed them to access a vast array of study materials in a compact and portable format, eliminating the need to carry bulky braille books.

Moreover, the auditory nature of audio books and notes provided a dynamic learning experience, enabling students to engage with the content through listening, which they found more efficient and comfortable. This preference underscores the shifting trends in adaptive learning methods, where technology-driven solutions like audio devices are increasingly valued for their versatility and practicality in accommodating the diverse needs of students with visual impairment.

As well, some students expressed a preference for audio materials due to challenges with their reading speed in braille. For them, consuming content in braille was a slower process compared to listening to audio. As a result, they found that they could revise and review larger amounts of content more efficiently when listening to audio materials. This efficiency allowed them to spend less time on revising and more time on grasping the content, ultimately enhancing their learning experience.

This was explained by P6, “Actually you know with this audiobook they require listening, “It needs listening skills. And for me I'm very good with listening”. So, for me I don't even like braille the same way I like soft copy. For me I lost my sight when I was already an adult so I learnt braille just for writing and I am not very fast reading it. I can read 5 pages in very many minutes, so audio has become the best way for me”

This asserts how the flexibility and adaptability of audio materials catered to the individual learning pace and needs of students with visual impairments, enabling them to optimize their study strategies and achieve better academic outcomes.

#### **4.3.4 Challenges associated with using audio devices**

The students with visual impairment at this school identified two significant challenges associated with using audio devices. The first challenge is the occasional blackout of electricity, which means they sometimes cannot use their devices when they need them the most. As P8 clarified,

“Power is not consistent especially at night if your device goes off you have to wait until when there is electricity. Power interruption is a great challenge in this school.

Besides, the teachers revealed that the department had a backup power system, a solar setup, to mitigate the effects of power outages. Though, they encountered issues with the battery, which malfunctioned from time to time, resulting in disruptions to the students' access to their audio devices. This insists the importance of reliable organization to support the use of assistive technologies in educational settings. Without a Constant dependable power sources, students with visual impairments face additional challenges in accessing audio materials that are

essential for their learning. Addressing these infrastructure issues is crucial to ensuring equitable access to education for all students with visual impairment, regardless of their abilities or geographical location.

Another challenge identified by these students was restrictive policy of the school, which prohibits them from taking home the audio devices assigned to them. This policy creates a significant obstacle as students are unable to transport their notes and class recordings home with them. Consequently, they are unable to engage in meaningful review and study outside of school term, limiting their opportunities for independent learning and revision.

This constraint not only impedes their academic progress but also reinforces inequalities by further disadvantaging students with visual impairments compared to their sighted peers who may have greater access to educational resources outside of the school while on holiday. Addressing this policy barrier is essential to ensure that visually impaired students have equitable opportunities to fully engage with their education and fully achieve their academic success.

In conclusion, this study sheds light on the utilization, challenges, and opportunities associated with the use of audio devices among students with visual impairments at the school of study. Through interviews and observations, it was evident that audio devices played a crucial role in facilitating access to educational materials and enhancing the learning experiences of visually impaired students. Participants reported using audio devices on a daily basis, utilizing them for recording classroom proceedings, accessing audio books, and listening to notes and textbooks. This widespread utilization sustains the importance of audio devices in overcoming barriers to education faced by students with visual impairments.

Moreover, students and teachers alike identified numerous benefits associated with the use of audio devices. These benefits included the ability to cope with fast-paced classroom environments, facilitate independent learning, and minimize the burden of carrying bulky braille books. Students expressed appreciation for the flexibility and convenience afforded by audio devices, enabling them to engage with educational materials in ways that suited their individual needs and preferences. Also, audio devices provided a valuable resource for students with visual impairment to access educational content outside of the classroom, empowering them to pursue independent study and revision.

However, the study also revealed significant challenges and limitations related to the use of audio devices. These challenges included occasional power outages, restrictive school policies prohibiting learners from taking home their devices, and difficulties in understanding synthetic speech, particularly with regard to accents. These trials give emphasis to the need for comprehensive support systems and infrastructure to ensure the effective integration of audio devices into the educational experiences of visually impaired students. Additionally, opportunities exist to leverage advancements in assistive technology and address systemic barriers to promote greater accessibility and inclusivity in education for students with visual impairments.

To conclude, the findings of this study uphold the complex nature of utilizing audio devices in education for learners with visual impairments. While audio devices offer significant benefits in terms of access to educational materials and independent learning, they also present challenges that must be addressed to maximize their effectiveness. By recognizing and addressing these challenges,

teachers and policymakers can work towards creating more inclusive and equitable learning environments that empower all students with visual impairment to reach their full potential.

### **Suggestions to overcome challenges in the use of ICT in learning by students with visual impairment**

The study has noted that top on the challenges facing the teaching of ICT to the visually impaired students is inadequate resources which range from availability of few computers with JAWS, unreliable and limited access, insufficient ICT tools and limited availability of headsets which are needed in aiding teaching and learning. Inadequacy of the above identified resources has made it extremely hard and difficult to teach ICT to students with visual impairment in this secondary school. However, the participants suggested the following solutions during the interview:

- The school should have other alternatives/reliable power sources to be used by students when there is no electricity example the solar and a generator.
- The school administrators should lobby to ensure that all the computers in the Lab are functional and are installed with JAWS.
- The school should have adequate devices for each student with visual impairment for effective teaching and learning of ICT.
- Teachers should be fully sensitized about adaptation of software devices
- More time should be allocated for practical work for students with visual impairments.
- The administrators should ensure that the computers are safe from thieves and viruses to avoid losing students' notes.

- Parents should support their children by buying them smartphones, memory cards and headsets to enable them revise while at home.
  - School administrators should be sensitized on how the devices should be upgraded and be flexible to provide resources for upgrading the JAWS each time it is required.

#### **4.4.5 Use of Audio devices by students with visual impairment**

This study also sought to explore the advantages of audio devices for students with visual impairments. The investigation revealed common uses such as listening to audio books, as well as the significant practice of recording classroom proceedings and notes, particularly in situations where braille papers are unavailable or braille machines are malfunctioning. This is in addition to those students who just prefer hearing their notes, to reading braille.

The utilization of recorders by students to accommodate fast-paced teaching underlines systemic challenges within inclusive education came out strongly as one of the findings of this study. This is in line with what Valencia et al., (2023) discovered that students with visual impairment utilize audio notification and voice-notification interface. This aids these students in navigating audio-based activities such as instructing, audiobooks and thought-provoking queries.

Therefore, addressing these systemic issues requires a concerted effort to provide teachers with the necessary support and resources to effectively meet the needs of students with disabilities in inclusive settings. In Uganda and in most parts of the world, teachers who did not undergo special education are routinely required to support learners with special educational needs, which can be extremely difficult.

It begs the question whether some components of special needs education should be mandatory requirement of all teachers training across all levels.

From the study findings, most students treated audio devices as alternative means of access to curriculum materials. Students testified recording their sighted counterparts who are best readers in recording novel using CD players. This is not different from what Efstathiou et al., (2015) suggested that the use of CD player is most appropriate while teaching English as a foreign language to visually impaired students.

Audio devices serve as alternative means of access and learning, offering flexibility and adaptability in educational settings. This was one of the most preferred modes of learning by students with visual impairment in the school of study. Students reported that they could listen to the CD players even in their phones.

Challenges with electricity supply significantly hinder the effective utilization of these devices, particularly in regions with unreliable infrastructure such as many parts of Africa, including Uganda. Amponsah & Bekele, (2023) indicate the impact of inadequate infrastructure on educational outcomes in developing countries, emphasizing the need for investment in robust infrastructure to support the integration of technology in education. Thus, addressing issues related to electricity supply is crucial for enabling the effective use of audio devices and other technological tools in educational contexts, particularly for students with visual impairments.

## CHAPTER FIVE

### SUMMARY, CONCLUSIONS AND RECOMMENDATION

#### 5.1 Introduction

This study has revealed the dual nature of online training, the utilization of soft copy notes and digital learning materials, and the use of audio devices among visually impaired students. While both students and teachers emphasized the benefits of these technologies, they also encountered significant challenges. This chapter will present summary, conclusion and recommendations aimed at harnessing the potential of Information and Communication Technology (ICT), particularly in the realms of online training, the experiences of soft copy learning materials, and utilization of audio devices, to enhance the learning experience of students with visual impairments. The summary of findings is organized according to the three main objectives of the study.

#### 5.2 Summary of findings

One of the keys finding of the study was that on line instruction is vital and fundamental in access to information, concepts and materials online. However, the teachers involved in the study acknowledged that they had not made any concerted efforts to instruct the students on how to utilize video conferencing or streaming platforms. This underscores the teachers own limitations in adapting to these technologies and the external challenges posed by unreliable internet connectivity. The study revealed multifaceted experiences Students with visual impartment in navigating online platforms, revealing both the potentials benefits and significant challenges associated with these technologies like struggling with navigating the interface of online conferencing platforms, hindering their ability to engage in real-time interactions.

The study recognized one significant highlighted by the participant is the enhanced accessibility and flexibility offered by digital formats. Students expressed appreciation for the ability to access materials on electronic devices such as e-readers and computers. The findings also noted the ease of navigation and search functionalities available in soft copy. Students with visual impairment also highlighted the portability and durability of oft copy materials. The findings revealed numerous challenges experienced by students with visual impairment like risk of computer viruses. Inadequate devices, students also lamented the difficulty in understanding the text to speech voices built in to the reading devices, institutional policies and accessibility barriers.

The study identified numerous uses associated with audio devices like recording and revisiting classroom notes. The ability to adjust playback speeds allows students with visual impairment to engage with content at a pace that suits their individual learning needs. Mitigating the challenge posed by fast-pace instruction. Most students expressed a preference for audio materials because they could revise and review larger amounts of content efficiently.

## **5.2 Conclusions**

### **5.2.1 Whether students with Visual impairment benefit from online instruction**

The exploration of online instruction for students with visual impairment has provided valuable insights into the experiences and potential of these technologies in enhancing educational access and outcomes. Through interviews with teachers and students with visual impairment, a deeper understanding of the benefits, challenges, and opportunities associated with these technologies has been gained. The findings of the study revealed that online instruction to visually impaired

students is vital and fundamental in excess of information, concepts and materials online, which may be challenging through traditional methods like reading in the library. Online instruction is the appropriate technology with the features which are embedded altogether in instructing ICT which makes it easier for the visually impaired students to access necessary and required information for and during learning.

The study revealed that online instruction has emerged as a promising avenue for overcoming barriers to education for students with visual impairment. It offers the potential to provide specialized support and adapt teaching methods to meet individual needs. However, challenges such as difficulties in navigating online platforms highlight the importance of tailored support and training for both students and educators were highlighted.

### **5.2.2 Experiences of students with Visual Impairment on notes given in soft copy**

Software materials showed significant experiences of students with visual impairment, including the reduction of reliance on bulky braille books and increased efficiency in accessing educational content. The study has revealed that the basis for accessible learning is laid by a variety of technical instruments, including computers and cellphones. Students with visually impairment can interact with software content easily when using devices with voice recognition software like JAWS, which provides auditory support.

In addition, a specialized tool that suit to different needs and improve readability and comprehension is made available in different formats as such Microsoft word or Docx format, portable document format and Rich text format. The learning

materials are scanned and put in formats that students with visual impairment can access and all these are essential in their education. Yet, challenges persist in adapting materials for subjects like mathematics, where tactile learning remains essential.

According to the study findings, utilizing soft copy notes to learn has resulted in significant time saving compared to the past, when time was frequently spent making sure students understood topics and concepts. The use of soft copy materials in the instruction of students with visual impairment has proven time-saving strategy for both teachers and students with visual impairment.

### **5.2.3 Ways in which students with visual impairment use audio devices**

According to this study, audio devices have proven valuable in providing alternative means of accessing educational content, particularly through recording classroom proceedings and playback functions. Victor stream readers, plex talk, Blaze ET and orbit Reader 20 have been revealed to be of great importance in the instruction of the visually impaired students in this study. As mentioned by most participants, audio devices allowed them to access greater variety of educational resources. Students can fully immerse themselves in digital materials when using headphones and combine with other tailored tools such as victor readers' that offer personalized methods to listen and interact with the content, fitting a range of learning preferences for these students.

However, challenges such as power outages and restrictive school policies continue to hinder their effective utilization. Addressing these challenges requires innovative solutions and advocacy for policy changes to support students with visual impairment in accessing and utilizing the audio devices.

Basically, online instruction, software learning materials, and audio devices offer promising experiences to enhance educational access and outcomes for students with visual impairment. However, realizing their full potential requires collaborative efforts from educators, policymakers, and technology inventors to develop accessible and inclusive educational resources. By working together, we can ensure that all students, regardless of visual impairment, have equitable access to quality education and chances for success.

The study objectives were achieved. Participants expressed their joy on mentioning the benefits of online instructions, expressing their experiences of notes given in soft copy and how these students utilized the audio devices. The research confirmed that ICT based instruction improves learning of students with visual impairment by making lessons more interesting, uniting knowledge through a variety of sensory modalities, and enabling students to apply their ICT skills to a variety of academic disciplines.

Nevertheless, the findings revealed that teachers lack proficiency in online instruction. Teachers admitted of having challenges in conducting on line instructions. As a result, it has impacted negatively to the learning of students with visual impairment in this school. Students are still struggling with connectivity and navigating the interface of online conferencing platforms.

The study suggests that the above need be addressed urgently through practical means of training teachers with ICT for students with visual impairment. Teachers need skills of effortlessly incorporating these technologies into their classes so that visually impaired students can succeed. Furthermore, teachers should become aware of the needs of each individual student and adapt their instructional strategies

accordingly. Teachers are required to be empowered to provide a dynamic stimulating educational environment through continuous use of assistive technology for students with visual impairment. By using such applications in instructing visually impaired students in secondary schools, learning will become easy and interesting.

## **5.4 Recommendations**

Students with visual impairment expressed many benefits of online teaching in the context of their education. They also identified many challenges. Below are some recommendations to address these challenges:

### **5.4.1 Whether students with Visual impairment benefit from online instruction**

The study has found out that students with visual impairment in Gulu high secondary school in Gulu city do not benefit from online instruction. Students veined the persistent difficulties in navigating online platforms practically in controlling interface elements reflecting broader gap in knowledge and use by both teachers and students with visual impairment. I therefore recommend:

#### **Comprehensive Training Programs**

The findings revealed that students had limited proficiency in user interfaces. Stakeholders in education should develop comprehensive training programs for both students on how to effectively use online platforms for education. These programs should cover technical aspects such as connecting to video conferencing platforms and navigating online learning interfaces, as well as strategies for optimizing the online learning experiences for visually impaired students.

#### **Accessible Platform Design**

The study revealed significant challenges of students with visual impairment to connect to online conferencing platforms like zoom and Google meet. Disability groups such as UNAB and stakeholders in education and ICT such as ministry of education and Uganda communications commission should advocate for the development of online learning platforms with accessibility features specifically designed for visually impaired students. These suggestions should be put to platform developers such as Microsoft, Zoom, and Google Meet etc. These features could include customizable user interfaces, compatibility with screen readers and magnifiers, and options for adjusting text size and contrast. Additionally, platforms should prioritize compatibility with assistive technologies commonly used by visually impaired students, such as Jaws in secondary schools.

### **Teacher Training and Awareness**

The study findings uncovered demographic diversity of teachers the imperative for inclusive educational practices that prioritize accessibility and equity. Ministry of education and sports along with its partners should provide specialized training and support for teachers to enhance their awareness of the needs of visually impaired students in online learning environments. This training should emphasize inclusive teaching practices, effective communication strategies, and methods for adapting instructional materials to accommodate diverse learning needs of all students with visual impairment in secondary schools.

### **Collaborative Learning Opportunities**

The findings of the study revealed few computers installed with JAWS for students with visual impairment. A wheeled mouse enables a student to zoom in and out when required. When this is not done, students will miss the opportunities for learning. Schools offering education to students with visual impairment should

encourage the implementation of collaborative learning opportunities that leverage online platforms to facilitate peer support and interaction among visually impaired students. These opportunities could include virtual study groups, online discussion forums, and collaborative project-based learning activities. This can help students with visual impairment to get used to online platforms for learning, and most importantly it will encourage students with visual impairment to support each other since some students are better than others in technology.

### **Policy Advocacy**

The study findings revealed institutional policy which does not allow the students with visual impairment to carry the devices and use them to revise like their sighted peers during holidays. Ministry of education and sports, and all stakeholders in education of students with visual impairment should advocate for policy initiatives at the institutional and governmental levels to promote the adoption of inclusive practices and accessibility standards in online education. This may include advocating for funding support for the development of accessible online learning resources, as well as policies that require educational institutions to ensure equal access to online education for visually impaired students.

Policy advocates should also campaign for frameworks that promote funding for internet infrastructure to allow access and utilization of online platforms.

### **Feedback Mechanisms**

The findings exposed lack of ICT integration and use in education of visually impaired students. Stakeholders in education should establish feedback mechanisms to regularly assess the effectiveness of online training programs and

identify areas for improvement. Solicit input from both students and teachers to gather insights into their experiences with online learning platforms and identify any barriers or challenges they may encounter. Use this feedback to inform ongoing program development and refinement.

By implementing these recommendations, educational stakeholders can work towards creating more inclusive and accessible online learning environments that empower visually impaired students to fully participate in and benefit from online education opportunities.

#### **5.4.2 Experiences of students with visual impairment on notes given in soft copy and learning materials.**

The study uncovered patterns of usage, reasons for preference, benefits as well as associated challenges pertaining soft copy notes and learning materials. I therefore recommend the following:

##### **Addressing Accessibility Barriers**

The findings revealed challenges of learning mathematics by students with visual impairment. The teachers highlighted that while they could render many course materials in soft copy, they didn't know how to do the same for mathematics. Schools should invest in the development and implementation of accessibility standards and guidelines for digital learning materials, ensuring compatibility with assistive technologies such as screen readers, magnifiers, and refreshable braille displays.

Ministry of education and sports should provide comprehensive training and support for teachers and content creators on accessible document formatting

techniques, including proper use of headings, alternative text for images, and logical reading order.

Ministry of education and NCDC should collaborate with educational publishers and technology companies to prioritize the production of accessible digital content, facilitating equal access to learning materials for visually impaired students in secondary schools.

### **Improving Availability and Distribution**

The study pointed out that the few available computers with JAWS do not give virtual practical exercises to students with visual impairment to participate in hands-on activities and develop ICT skills. Ministry of education should establish a centralized digital library or online platform specifically designed for visually impaired students, offering a diverse range of accessible digital learning materials across various subjects and grade levels.

National curriculum development center and its partners should implement policies mandating the provision of soft copy versions of all printed materials to visually impaired students, ensuring equitable access to educational resources both inside and outside the classroom.

### **Enhancing Usability and User Experience**

The findings revealed how student with visual impairment access notes given in soft copy use it in many ways, by giving the key commands, navigate looking for information. Stakeholders in education should conduct regular usability assessments and user testing sessions with visually impaired learners to identify and address usability issues, ensuring that digital learning materials are intuitive, easy to navigate, and responsive to diverse learning needs.

Stakeholders in education should incorporate user feedback mechanisms into the design and development process of digital learning materials, allowing students with visual impairment to provide input on their preferences, challenges, and suggestions for improvement.

Ministry of education should foster collaboration between teachers, technologists, and accessibility experts to co-design inclusive digital learning environments that prioritize usability, engagement, and learning outcomes for visually impaired students in secondary schools.

### **Promoting Awareness and Advocacy**

The study revealed lack of headphones by most students because most parents did not buy them for their children. Stakeholders, policymakers, and the broader community about the importance of parental support and provision of accessible digital learning materials for visually impaired learners and the impact of accessibility barriers on their educational attainment.

Stakeholders in education should empower visually impaired students of self-advocacy for their accessibility needs and rights within educational settings, fostering a culture of inclusion, empowerment, and equity in ICT education.

By implementing these targeted recommendations, educational institutions and stakeholders can mitigate the challenges associated with the utilization of soft copy notes and digital learning materials, fostering a more inclusive, accessible, and supportive learning environment for visually impaired students.

#### **5.4.3 Use of audio devices by students with visual impairment**

The study findings revealed common use of audio devices such as listening to audio books, as well as the significant practice of recording classroom proceedings and notes, particularly in situations where braille papers were unavailable or braille machines broke down. Other students just preferred listening to their notes in any environment of their choice. The study exposed significant challenges which did not allow effective use of audio devices and therefore I recommend the following.

##### **Mitigating the Impact of Power Outages**

The study findings showed unstable electricity and solar systems. Schools should implement sustainable power solutions, such as solar-powered charging stations or backup generators, to ensure continuous access to audio devices during power outages.

The school should provide training to students with visual impairment on proper power management practices to extend the battery life of audio devices and maximize their usability during periods of limited power supply.

##### **Addressing Prohibitive School Policies**

The study findings indicated strict policy on laboratory schedules and use of the devices only during the school time. The department of special needs should advocate for the revision of school policies that prohibit visually impaired students

from using the devices and taking home their assigned audio devices, recognizing the importance of uninterrupted access to learning materials beyond the classroom.

Stakeholders should collaborate with school administrators, teachers, and policymakers to develop inclusive policies that empower visually impaired students to use audio devices flexibly, facilitating independent learning and revision outside of school hours. Efforts can be put in procuring more devices to address the challenges of inadequate resources.

Parents should buy individual audio devices for their children with visual impairment so that they can access and use them at home.

### **Ensuring Device Accessibility and Usability**

The study revealed challenges of breakdown of computers. Provide comprehensive training and technical support to visually impaired students on how to effectively operate and troubleshoot audio devices, including navigation of menus, playback controls, and file management functionalities.

Organizations who work in the provision of audio devices should leverage their buying or customers powers and work with manufacturers and developers to enhance the accessibility features of audio devices, especially on accents or speech clarity for the built-in voices.

### **Expanding Access to Digital Audio Content**

The study also revealed the challenges of accent suitability in TTS voices which requires collaboration between technology and developers. The ministry of education should collaborate with educational publishers, libraries, and online platforms to expand the availability of digital audio content, including textbooks,

study guides, and supplementary materials, tailored to competency-based curriculum and national goals of education.

The ministry of education and National curriculum development center should invest in the development and distribution of locally relevant audio materials in regional languages and dialects, ensuring equitable access to educational resources for visually impaired learners in diverse communities.

By implementing these recommendations, educational institutions and stakeholders can overcome the challenges associated with audio devices for visually impaired students, fostering an inclusive learning environment where all students have the opportunity to thrive and succeed.

### **5.5 Suggestions for Further Research**

The study recommends future research in the following areas:

- Effective use of online instruction for students with visual impairment in secondary schools
- The role of special needs tutors in training teachers with ICT for students with visual impairment in teacher training institutions
- Ways of integrating ICT digital learning materials during instruction of students with visual impairment in secondary schools

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## APPENDICES

### Appendix 1: Appendix II: Interview Guide for Teachers

#### Bio data for Teachers

AGE	SEX	YEARS OF EXPERIENCE	QUALIFICATION	SPECIALIZATION
				Masters in SNE
				Postgraduate in SNE
				3 Months course in SNE
				Sensitization workshop
				No specialization training

**Objective one: To examine whether students with visual impairment benefit from online teaching**

Do you have students with visual impairment in your class?

If yes, how many students with visual impairment do you have?

For how long have you been teaching students with visual impairment?

Do you conduct online lessons with students with visual impairment?

If yes, how often do you conduct online lessons for learners with visual impairment?

1. How have you found the transition from physical teaching to online teaching?
2. Do you involve your students in online teaching? What specific challenges do students with visual impairments face when adapting to and utilizing ICT in their educational activities?
3. What challenges do you experience during the online teaching?
4. In what ways does online contribute to overall experiences of students with visual impairment?
5. What specific online teaching tools have been most effective in supporting students with visual impairments in their process of learning?

**Objective two: Experiences of students with visual impairment on notes given in soft copies**

1. How do you give notes to your students during teaching?
2. How do they store the notes for revision?
3. What challenges do you face when utilizing software during teaching?
4. Is giving notes to students with visual impairment in soft copies of any benefit to them?
5. What recommendations or improvements can you suggest to enhance the use of this software in secondary school?

**Objective three: How students with visual impairment use the Audio devices during teaching.**

1. Do you have Audio devices for students with visual impairment in this school?
2. Which audio devices do you use during teaching?
3. How do you utilize the audio devices for effective teaching in class?
4. What challenges do you experience while using audio devices during teaching?
5. In your experience, are audio devices beneficial to students with visual impairments?

## **Appendix II: Interview Guide for students with visual impairment**

Do you study through online lessons in your class?

If yes, how often are you taught through online lessons?

### **Objective one: To examine whether students with visual impairment benefit from online teaching**

1. Are you able to connect devices to the online lecture?

If you are able to connect, how do you benefit from the lecture?

If you are not able to connect, what do you do?

2. How do you mute and unmute the device during online teaching to ask question or make comment?

3. Do you raise your hand during the online teaching in order to contribute?
4. How do you benefit when the teacher shares the screen?
5. What do you do when the voice of the teacher is either too low or too high during an online lesson?

**Objective two: Experiences of students with visual impairment on notes given to them in soft copies**

1. How do you receive the notes from the teacher?
2. How do you read/revise the notes given?
3. Briefly explain how you store the notes given.
4. What challenges do you experience with notes in soft copies?

**Objective three: How students with visual impairment use the Audio devices.**

1. Do you use any audio devices in your learning?  
If yes which ones do you use?
2. How do you utilize these audio devices?
3. What challenges do you experience while using audio devices?

## Appendix IV: Introductory Letter

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

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Date: 3/05/2024

**TO WHOM IT MAY CONCERN**

**RE: KAMONDAI MARY NJOKI**

Dear Sir/Madam,

This is to introduce to you the above-named student Reg: No **21/U/GMSN/14208/PE** pursuing Master of Special Needs Education, Department of Special Needs and Rehabilitation, Kyambogo University.

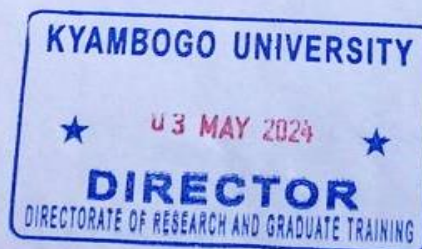
She intends to carry out research on **“Examining the Experiences of Students with Visual Impairment during Information Communication technology – Based Instruction in Secondary Schools in Gulu City.”** in partial fulfillment of the requirements for the award of Master of Special Needs Education of Kyambogo University.

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

Any assistance rendered to her will be highly appreciated.

Yours sincerely

  
Prof. Bosco Bua  
**AG. DIRECTOR**



## Appendix IV: Letter to the School Administrator

Kyambogo University  
P. O box 1, Kampala.  
21<sup>st</sup> February 2024.

To the Headteacher  
Gulu high school,  
P.O box 202,  
Gulu City (U).  
Dear Sir,

### **RE: REQUEST TO CARRY OUT DATA COLLECTION IN YOUR SCHOOL**

I am **KAMONDAI MARY NJOKI** currently pursuing a Master's degree in special needs education at Kyambogo University. My registration number is **21/U/GMSN/14208/PE**. Am conducting a research focusing on **“Experiences of students with visual impairment: Information Communication Technology based- instruction a case of one secondary school in Gulu City.”** The study will involve conducting interviews to four teachers and six students with visual impairment in this school which will assist in gathering information required for the study. I have chosen this school for its recommendable track in record of embracing ICT for students with visual impairment. I am eager to collaborate with the school in exploring this important aspect of supporting the education of students with visual impairment.

I assure you that the interviews will be conducted with the utmost respect for ethical guidelines. I humbly request you to allow me collect data from your institution. The responds from your school will be highly treasured, confidentially kept and used for education purposes only.

Thanks

Yours sincerely,



KAMONDAI MARY NJOKI

Kamopaul02@gmail.com

Appendix VI: Letter to the participants



P. O. BOX 1 KYAMBOGO

Tel: 0414-286743

Email: [deanofstudents@kyu.ac.ug](mailto:deanofstudents@kyu.ac.ug), [www.kyu.ac.ug](http://www.kyu.ac.ug),

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I am **KAMONDAI MARY NJOKI** a student of Kyambongo University conducting a study as part of a requirement for the award of degree of masters of special needs education. The topic of the study is “**Experiences of students with visual impairment: Information Communication Technology based-instruction a case of one secondary school in Gulu City.**”

I humbly request you to respond willingly in providing the required data on the topic. Your respond will be highly treasured, confidentially kept and educationally used.

Thanks

Yours sincerely,



**KAMONDAI MARY NJOKI**

Kamopaul02@gmail.com

Appendix VI: Consent form



P. O. BOX 1 KYAMBOGO

Tel: 0414-286743

Email: [deanofstudents@kyu.ac.ug](mailto:deanofstudents@kyu.ac.ug), [www.kyu.ac.ug](http://www.kyu.ac.ug),

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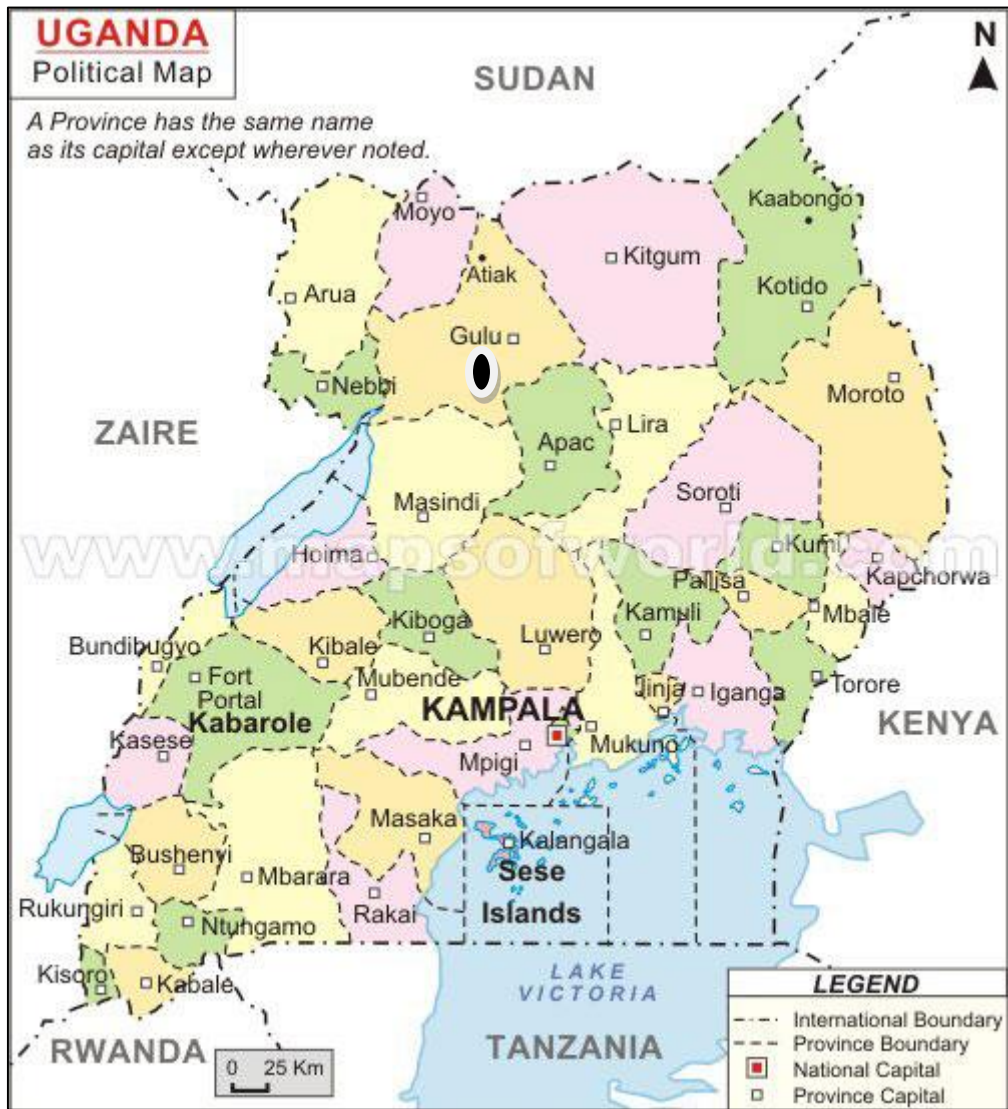
**Research Title: Experiences of students with visual impairment: Information Communication Technology based- instruction in one secondary school in Gulu City.**


I .....  
consent to participate in the research to be conducted by **KAMONDAI MARY NJOKI** as it has been described to me in the information sheet. I understand and agree that the data collected will be used for the study's purpose only.

Signed...

Date...

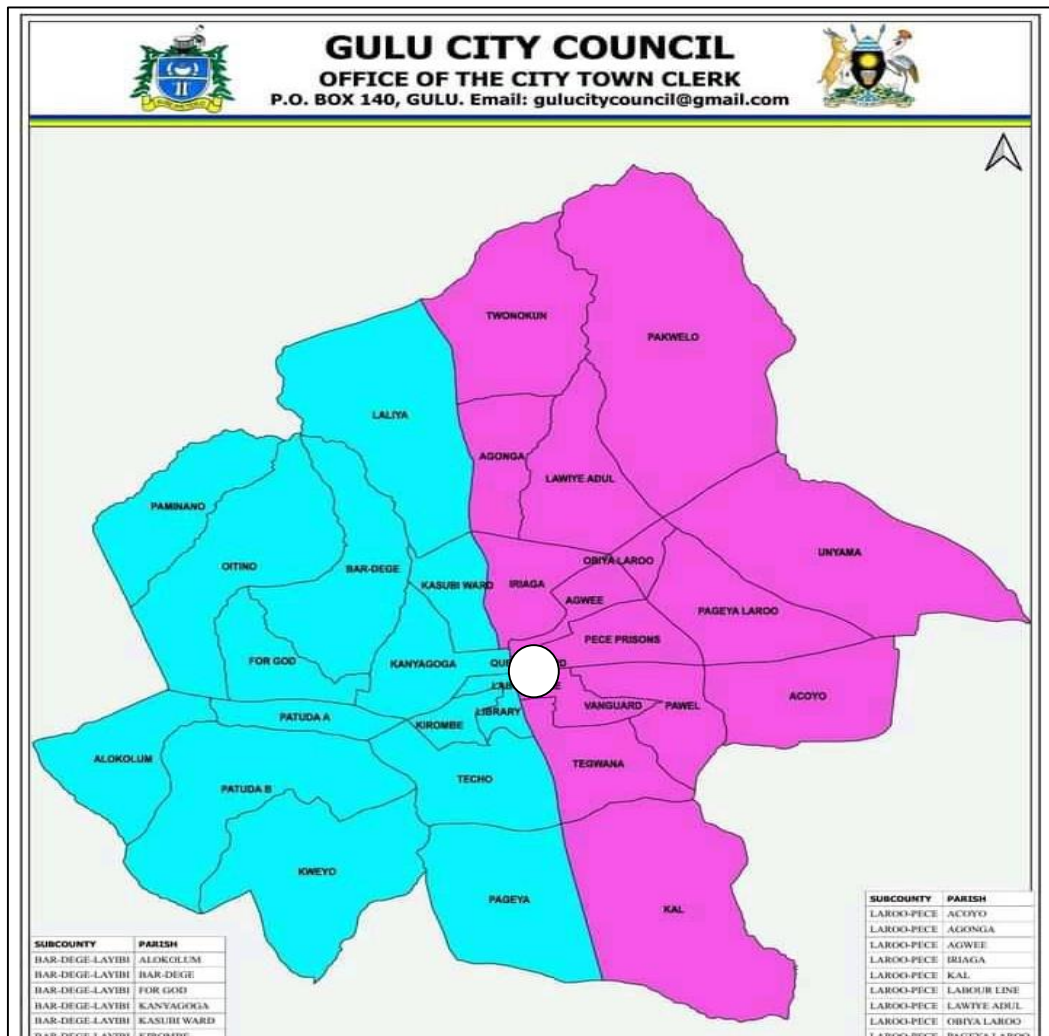
**Appendix VIII: Map of Uganda showing Gulu City**



Key      Gulu City 

Source: Adapted from Uganda Bureau of Statistics, 2020

Appendix IX: Map of Gulu City showing Area of study



Key  Area of study

Source Gulu City council 2022