

**EXPERIENCES OF STUDENTS WITH VISUAL IMPAIRMENTS IN UTILIZING
ASSISTIVE TECHNOLOGY DEVICES FOR LEARNING IN A UGANDAN PUBLIC
UNIVERSITY**

BY

BINASALI KYEBAGADHA

15/U/15958/GMSN/PE

**A DISSERTATION SUBMITTED TO THE DIRECTORATE OF RESEARCH AND
GRADUATE TRAINING AS PARTIAL FULFILLMENT FOR THE AWARD OF THE
DEGREE OF MASTER OF SPECIAL NEEDS EDUCATION OF KYAMBOGO
UNIVERSITY**

NOVEMBER, 2025

DECLARATION

I, Binasali Kyebagadha, hereby declare that this research dissertation titled “**Experiences of Students with Visual Impairments in Utilizing Assistive Technology Devices for Learning in a Ugandan Public University**” is my original work and has never been submitted to any institution for any award.

Signature

Date.....

BINASALI KYEBAGDHA

APPROVAL

We certify that this dissertation titled “*Experiences of Students with Visual Impairments in Utilizing Assistive Technology Devices for Learning in a Ugandan Public University*” has been carried out under our supervision and submitted with our approval.

Signature Date

Dr. Patrick Ojok

Principal Supervisor

Signature Date

Dr. Ali Ayub Bagumemu

Co-Supervisor

DEDICATION

This dissertation is lovingly dedicated to my family; my devoted wife, Ms. Nuwahereza Doreck, and my precious son, Abiyy Kyebagadha whose boundless love, patience, and encouragement have been my source of strength and inspiration. Their unwavering belief in me has illuminated every step of this academic journey.

ACKNOWLEDGEMENT

The completion of this dissertation marks a significant milestone in my academic journey, and I owe its success to the support and encouragement of many individuals and institutions.

First and foremost, I glorify the Almighty Allah for His grace, wisdom, and favor that have sustained me throughout my Master's degree. Truly, without His divine guidance, this accomplishment would not have been possible.

My deepest appreciation goes to my supervisors, Dr. Patrick Ojok and Dr. Ali Ayub Baguwemu, for their patience, mentorship, and invaluable guidance from the inception of this study to its completion. I am equally grateful to Dr. Odette Niyisabwa Tumwesigye for her intellectual direction and encouragement that strengthened the quality of this work.

I sincerely thank my colleagues and friends at Kyambogo University for their teamwork and moral support. Special thanks go to Dr. Isiko Alexander Paul, Mr. Kibedi Wanume Hakim, and Mr. Bahemuka Julius, whose friendship, advice, and constant motivation greatly enriched my academic experience.

To my parents, brothers, and sisters, I am forever indebted to you for your prayers, love, and unwavering belief in me. You are the pillars behind every success I celebrate.

Finally, I extend my heartfelt gratitude to all the participants who willingly shared their experiences, making this research possible. May the Almighty Allah reward each of you abundantly.

LIST OF ABBREVIATIONS AND ACRONYMS

A I	Artificial Intelligence
A T	Assistive Technology
CSUCS	Context Sensitive User Centered Scalability
GPS	Global Positioning System
HAAT	Human Activity Assistive Technology
HPM	Human Performance Model
ICT	Information and Communication Technology
JAWS	Job Access With Speech
NVDA	Nonvisual Desktop Access
UK	United Kingdom
UN	United Nations
UNCRC	United Nations Convention on the Rights of the Child
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations International Children's Emergency Fund
W H O	World Health Organization

TABLE OF CONTENT

DECLARATION	ii
APPROVAL	iii
DEDICATION	iv
ACKNOWLEDGEMENT	v
LIST OF ABBREVIATIONS AND ACRONYMS	vi
TABLE OF CONTENT	vii
LIST OF TABLES	x
ABSTRACT	xi
CHAPTER ONE: INTRODUCTION	1
1.0 Introduction	1
1.1 Background of the Study.....	1
1.2 Statement of the Problem	5
1.3. Purpose of the study	6
1.4. Research Objectives	6
1.5. Research Questions	6
1.6. Scope of the Study.....	7
1.6.1 Content scope	7
1.6.2 Geographical scope	7
1.6.3 Time scope.	7
1.7. Significance of the Study	7
CHAPTER TWO: LITERATURE REVIEW	9
2.0 Introduction	9
Theoretical Framework	9
The Concept of Visual Impairment and access to education	10
Policy Framework on Assistive Technology	11
2.1. Assistive Technology Devices used by Students with Visual Impairment for Learning..	12
2.2. Experiences of using Assistive Technology Devices for Learning from the student’s perspective.....	13
2.3. Enablers for Utilization of Assistive Technology Devices for Learning	15

2.4. Barriers to Utilization of Assistive Technology Devices for Learning to Students with Visual Impairment.....	16
CHAPTER THREE: METHODOLOGY.....	18
3.0 Introduction.....	18
3.1 Research Approach.....	18
3.2 Research Design.....	18
3.3 Sampling Strategy.....	19
3.4. Population and Sample Size.....	20
3.5. Data Collection Methods.....	20
3.5.1. Semi-Structured Interviews.....	20
3.5.2. Non-Participant Observation.....	21
3.6 Data collection procedure.....	21
3.7 Data Analysis.....	22
3.8 Rigor and Trustworthiness.....	23
3.9. Positionality of the Researcher.....	24
3.10. Ethical Considerations.....	25
3.11. Limitations of the Study.....	26
CHAPTER FOUR: PRESENTATION AND INTERPRETATION OF FINDINGS	27
4.0 Introduction.....	27
Participants' Characteristics.....	27
4.1 Assistive Technology Devices Used by Students with Visual Impairments for Learning .	28
4.1.1 Screen Readers.....	28
4.1.2 Braille Displays.....	29
4.1.3 E-Book Readers.....	30
4.1.4 Speech-to-Text Software.....	30
4.1.5 Magnifiers.....	31
4.1.6 Use of Multiple Devices.....	31
4.2 Experiences on the Utilization of Assistive Technology Devices for Learning among Students with Visual Impairments.....	32
4.2.1 Positive Experiences.....	32
4.2.2 Negative Experiences.....	34

4.3 Enablers for Utilization of Assistive Technology Devices for Learning	36
4.3.1 Individual-Level Enablers	36
4.3.2 Family-Level Enablers	38
4.3.3 Classroom/Lecture Room-Level Enablers.....	38
4.3.4 University-Level Enablers	39
4.4 Barriers to Utilization of Assistive Technology Devices for Learning by Students with Visual Impairment	40
4.4.1 Individual-Level Barriers	41
4.4.2 Family-Level Barriers.....	43
4.4.3 Classroom/Network-Level Barriers.....	44
4.4.4 Teaching Method Barriers	45
CHAPTER FIVE: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS	47
5.0 Introduction	47
5.1 Summary of major findings	47
5.2. Conclusions.....	48
5.3. Recommendations based on study objectives	50
5.4. Suggested areas for further research	52
REFERENCES	53
APPENDICES	60
Appendix I: An interview guide for learners with visual impairment	60
Appendix II - Observation Guide.....	61
Appendix III: Consent Form	62

LIST OF TABLES

Table 1: Showing Population and Sample Size	20
---	----

ABSTRACT

The development of technology has been a major breakthrough for learners with visual impairments, enhancing their participation in educational activities. This study explored the experiences of students with visual impairments in the utilization of assistive technology (AT) devices for learning in Public Universities in Uganda, using Kyambogo University as the case study. The study was guided by four objectives: to identify the types of assistive technology devices used by students with visual impairments for learning; to explore the lived experiences of students with visual impairments in the utilization of assistive technology devices for learning; to examine the enablers of utilization; and to identify the barriers hindering utilization of assistive technology devices for learning by students with visual impairments in Kyambogo University. The study was guided by the Human Activity Assistive Technology (HAAT) model. A phenomenological research design within a qualitative approach was employed. The target population comprised all learners with visual impairments at Kyambogo University, totaling 96 students, from which 24 participants were purposively selected. Data were collected using semi-structured interviews and observation, and analyzed thematically to generate meaning-rich categories. Findings revealed that the availability of assistive technology devices in universities is inadequate to meet the learning needs of Students with Visual Impairments. Moreover, many students lacked the necessary skills to use available AT devices such as screen readers, Braille displays, and magnifiers, while some devices were incompatible with individual needs. Additionally, most lecturers lacked the competence to support learners with visual impairments in utilizing AT due to insufficient training. The study concluded that limited access, inadequate training, and lack of institutional support significantly constrain effective utilization of AT among Students with Visual impairments. It recommends that the Government of Uganda, through the Ministry of Education and Sports (MoES), should ensure adequate provision and maintenance of AT devices in universities enrolling SVIs. Furthermore, teacher education curricula should include modules on assistive technology, and non-governmental organizations (NGOs) should be encouraged to partner with universities in providing and maintaining AT devices.

Key Words: Assistive Technology, Visual Impairment, Inclusive Education, Lived Experiences, Uganda

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents the background and foundation of the study. It introduces the topic, situates it within the broader context of inclusive education, and outlines the key issues that necessitated the research. The chapter highlights the background to the study, the statement of the problem, the purpose of the study, the research objectives and questions, as well as the significance, scope, and justification of the study. Overall, this chapter establishes the rationale and direction of the study on the utilization of assistive technology devices for learning among students with visual impairments at Kyambogo University.

1.1 Background of the Study

Globally, assistive technology devices (AT) have become a cornerstone in advancing inclusive education, particularly for students with visual impairments (SVIs). The World Health Organization (WHO, 2021) estimates that over 1.3 billion people experience some form of visual impairment, of whom approximately 26 million live in Africa, including 20.4 million with low vision and 5.9 million who are blind. In Uganda, the Uganda Bureau of Statistics (UBOS, 2022) reports that about 3.8% of the population lives with visual impairments, representing roughly 1.8 million Ugandans, many of whom face challenges in accessing education and information. These statistics underscore the growing need for accessible learning environments and digital innovations to promote educational equity. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2006) emphasizes the right to education without discrimination, calling on states to ensure access to inclusive, quality, and free education for all learners, including those with disabilities.

Visual impairment refers to a condition in which an individual's sight cannot be corrected to a normal level even with the use of spectacles, contact lenses, or surgery, and includes both low vision and blindness (WHO, 2019). This study focused on students with visual impairments because, compared to other forms of disability such as hearing impairments, visual impairment poses unique challenges in accessing printed academic materials, digital content, and visual instructional media that dominate higher education learning environments. While students with

hearing impairments face communication barriers, they can still visually access written and digital content, whereas students with visual impairments depend heavily on assistive technologies to interact with text, images, and digital platforms. Thus, exploring their lived experiences offers deeper insights into how technology bridges the accessibility gap in academic participation.

Assistive technology devices refer to any equipment, software, or system that enhances, maintains, or improves the functional capabilities of individuals with disabilities (WHO, 2019). For students with visual impairments, assistive technology devices include tools such as screen readers (e.g., JAWS, NVDA), Braille embossers, magnifiers, talking calculators, and refreshable Braille displays. These devices transform inaccessible content into formats that can be read or heard, thereby enabling independent learning and participation in mainstream education.

In developed countries such as the United States, United Kingdom, Netherlands, and parts of Asia, the integration of assistive technology in higher education has evolved through sustained investment, legislative frameworks, and a strong culture of inclusion. In the United States, assistive technologies like JAWS, NVDA, Kurzweil 3000, and refreshable Braille displays have revolutionized access to digital content in universities. These innovations are supported by robust legal instruments such as the Americans with Disabilities Act (ADA, 1990) and the Individuals with Disabilities Education Act (IDEA, 2004), which mandate institutions to provide reasonable accommodations (American Foundation for the Blind [AFB], 2022). As a result, students with visual impairments can participate in mainstream courses with minimal barriers, supported by accessible e-learning platforms, adaptive software, and trained disability service units (Mulliken & Dey, 2021).

In Europe, the United Kingdom has made significant strides through strong inclusion policies, underpinned by the Equality Act (2010). Institutions such as the Royal National College for the Blind have pioneered tactile and auditory learning technologies, including the Talking Tactile Tablet (T3), which converts digital graphics into touch-sensitive surfaces that enhance conceptual learning for blind students (Royal National College for the Blind [RNCB], 2023). Similarly, in the Netherlands, inclusive higher education models have emphasized accessible digital learning platforms, leading to improved academic participation among students with visual impairments (de Boer et al., 2020).

In Asia, the use of assistive technology in universities has expanded rapidly in recent years due to digital inclusion policies. For example, Japan and Singapore have established comprehensive national frameworks promoting digital accessibility, including the integration of assistive technologies in virtual learning environments and provision of government-funded adaptive devices (UNESCO, 2022; Lim & Tan, 2023). Universities in these countries have also adopted Universal Design for Learning (UDL) principles that ensure learning materials and online systems are accessible to all students, regardless of disability status (Kawamura, 2022). These developments in the developed world demonstrate that deliberate investment, policy coherence, and institutional commitment can significantly enhance access and equity for students with disabilities including those with visual impairments.

In contrast, the adoption of assistive technology devices across African universities remains limited and fragmented. The African Union (AU) recognizes inclusive education as a critical driver of the Agenda 2063 vision for social transformation, yet resource constraints and weak policy enforcement have hindered progress. Studies across Kenya, South Africa, and Nigeria indicate that while awareness of AT is growing, many institutions lack sufficient funding, technical expertise, and maintenance capacity to sustain AT programs (Mwangi & Kigotho, 2021; Chisale, 2020). Nevertheless, initiatives such as the Kilimanjaro Blind Trust Africa (KBTA) project have improved access to digital learning through distribution of Braille embossers, screen readers, and capacity-building workshops in East African universities (Mutua, 2018). Similarly, the UNICEF (2019) framework on inclusive education in sub-Saharan Africa highlights ongoing pilot projects integrating low-cost AT in teacher training colleges. However, key barriers persist, including high device costs, inadequate local technical support, limited awareness among lecturers, and absence of clear national policies (Adoyo & Odeny, 2020). These challenges underscore the inequality in digital inclusion between developed and developing countries.

In Uganda, efforts toward educational inclusion has been guided by the Persons with Disabilities Act (2006), the Education and Training Policy for Learners with Special Needs (2011), and the National Inclusive Education Policy (2020). Despite this strong legal framework, implementation remains inconsistent. The introduction of assistive technology in Ugandan universities gained momentum with the “All We See Is Possibility” (AWSIP) program in 2014, which aimed to equip institutions such as Kyambogo University, Makerere University, and Gulu University with modern

AT devices and capacity building of instructors (AWSIP, 2014). However, reports suggest that only 5–15% of students with visual impairments regularly access or effectively utilize these technologies due to cost barriers, inadequate training, and unreliable internet connectivity (Kivumbi, 2018; Asiimwe, 2020).

Existing studies in Uganda have primarily explored accessibility and policy aspects rather than experiential dimensions. For instance, Nuwagaba (2016) examined policy inclusion of students with disabilities, while Kivumbi (2018) analysed institutional barriers to AT access in public universities. Asiimwe (2020) focused on policy implementation and resource allocation but did not capture the lived experiences or coping mechanisms of students navigating academic spaces with limited AT support. More recent analyses, such as Kasule (2022), emphasize infrastructural constraints and the need for digital literacy training but also recognize a growing demand for evidence-based approaches that centre the voices of learners themselves.

Kyambogo University (KyU) occupies a unique position in Uganda’s higher education landscape as the premier institution for teacher education and special needs education. The university hosts the largest population of students with disabilities, estimated at over 240 students, including those with visual, hearing, and physical impairments (Nexus Media, 2025; All Africa, 2024; Nile Post, 2024). The Kyambogo University Visio Hi-Tech Resource Centre, funded by Visio International and the Faculty of Special Needs and Rehabilitation, has been instrumental in fostering inclusive practices and piloting AT integration. The focus on Kyambogo University was therefore deliberate as it provides a representative case for understanding both the potential and limitations of assistive technology use in a university setting with a relatively advanced disability support infrastructure compared to other Ugandan institutions.

However, despite this institutional commitment, challenges persist. The National Council for Higher Education (NCHE, 2021) reports that KyU faces significant infrastructural limitations, insufficient AT equipment, and a shortage of trained personnel to support the use of assistive technologies. Moreover, many students with visual impairments rely heavily on peer assistance, audio recordings, or personal coping strategies to access learning materials (Kyambogo Disability Support Unit, 2023). These constraints limit the realization of equitable learning outcomes and

highlight the need for an in-depth understanding of how students themselves experience, perceive, and adapt to the use of AT within the university context.

Although global and regional research has demonstrated the transformative potential of AT in promoting inclusive higher education, there remains a critical knowledge gap regarding the lived experiences of students with visual impairments in Ugandan universities. Existing literature has tended to emphasize infrastructural availability, policy frameworks, or institutional readiness, with minimal attention to how students personally navigate academic life using assistive technologies. Furthermore, there is limited empirical exploration of how social, institutional, and technological factors interact to influence students' learning experiences in resource-constrained settings such as Kyambogo University.

The few studies conducted in Uganda (e.g., Nuwagaba, 2016; Kivumbi, 2018; Asimwe, 2020; Kasule, 2022) have not sufficiently illuminated the subjective realities, adaptive behaviours, and emotional dimensions of students' engagement with AT. This leaves a conceptual and empirical gap in understanding the connection between technology, disability, and higher education inclusion. Consequently, this study sought to bridge this gap by exploring the lived experiences of students with visual impairments in utilizing assistive technology devices for learning at Kyambogo University. The findings will contribute to policy enhancement, institutional programming, and the theoretical development of inclusive education frameworks in Uganda and similar contexts.

1.2 Statement of the Problem

Despite efforts to integrate information technology and promote inclusive education, students with visual impairments in higher education continue to face significant barriers that limit their learning opportunities. Although assistive technologies, such as screen readers and magnifiers, are available, their potential is not fully realized due to limited accessibility of academic materials, inadequate technical support, inconsistent institutional commitment, and attitudinal barriers among faculty and peers. These challenges undermine academic engagement, lower learning outcomes, and restrict the future career prospects of students with visual impairments.

Current research on disability inclusion has largely focused on general access issues, leaving a critical gap in understanding the lived experiences of students with visual impairments, particularly how they use, adapt to, and are supported in employing assistive technologies. Without such understanding, policies, pedagogical practices, and technological interventions remain insufficiently responsive to the real needs of these students, perpetuating inequities in higher education. Addressing this problem is therefore urgent to ensure that inclusive education moves beyond policy rhetoric to practical, meaningful support for students with visual impairments.

1.3. Purpose of the Study

The study aimed to explore the lived experiences of students with visual impairments in using assistive technology devices to support their learning at Kyambogo University.

1.4. Research Objectives

1. To identify the assistive technology devices for learning used by students with visual impairment in Kyambogo university.
2. To describe the lived experiences of students with visual impairment in the utilization of assistive technology devices for learning in Kyambogo university.
3. To explore the enablers for utilization of assistive technology devices for students with visual impairment in Kyambogo university.
4. To explore the barriers hindering the utilization of assistive technology devices for learning to students with visual impairment in Kyambogo university.

1.5. Research Questions

1. What assistive technology devices do students with visual impairment use for learning in Kyambogo University?
2. What are the experiences of students with visual impairment in utilizing assistive technology devices in Kyambogo University?
3. What are the enablers of utilization of assistive technology devices for students with visual impairment in Kyambogo University?
4. What are the barriers for utilization of assistive technology devices for learning to students with visual impairment in Kyambogo University?

1.6. Scope of the Study

1.6.1 Content Scope. The study focused on investigating the lived experiences of students with visual impairment in the utilization of assistive technology devices for learning in Kyambogo University. It was guided by four objectives which include; To identify the types of assistive technology devices for learning used by students with visual impairment for learning, to describe lived experiences of students with visual impairment in the utilization of assistive technology devices for learning, to identify the enablers of the utilization of assistive technology devices for students with visual impairment, to identify the constraints hindering the utilization of assistive technology devices for learning to students with visual impairment in Kyambogo university.

1.6.2 Geographical scope. The study was conducted at Kyambogo University which is located in Nakawa division, Kampala district. The geographical scope of this study is justified by the fact that Kyambogo university provides a representative and concentrated sample of students with visual impairments within a specific educational institution, allowing for an in-depth examination of their experiences, types and challenges regarding assistive technology devices for learning with potential insights and recommendations tailored to this particular academic environment.

1.6.3 Time scope. The study was conducted from October 2018 to March 2024. This time was adequate for research proposal writing, data collection and research report writing.

1.7. Significance of the Study

The findings of the study may;

Contribute to the field of inclusive education through exploring the lived experiences of students with visual impairments in utilizing assistive technology devices in a university context. The insights generated may deepen stakeholders' understanding of how assistive technologies facilitate or hinder the learning process for students with visual impairment, thereby informing the design of more appropriate and inclusive pedagogical strategies.

Provide empirical evidence regarding the specific technological and pedagogical needs of students with visual impairment, which can inform strategic planning at the institutional level. Universities and other higher education institutions may utilize these findings to improve the allocation of

resources, invest in appropriate assistive technologies, and strengthen support systems that foster equitable learning environments for all students, regardless of disability.

Stimulate interest in collaboration among key stakeholders including educators, researchers, policy-makers, and non-governmental organizations as it sheds light on the challenges and opportunities associated with the use of assistive technology in higher education.

Act as a catalyst for future research focused on enhancing ICT integration for learners with disabilities, thereby contributing to the broader discourse on inclusive and equitable education in Uganda and beyond.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

The review of relevant theoretical and empirical literature is presented in this chapter. The objectives of the study served as a guide for the literature sources. A number of areas are covered in the literature review, such as the concept of visual impairment and educational access, the Disability Policy Framework, assistive technology devices, obstacles that learners with visual impairments face when trying to utilize assistive technologies, factors that facilitate the use of assistive technology, and gaps in the literature.

Theoretical Framework

Human Activity Assistive Technology (HAAT) Model

The Human Activity Assistive Technology (HAAT) Model, introduced by Cook and Hussey in 1995, provides a comprehensive framework for understanding the interaction between individuals with disabilities and assistive technologies within specific contexts. The model comprises of four interrelated components namely; Human which represents the individual's physical, cognitive, and emotional characteristics, including abilities, limitations, and personal experiences, Activity encompassing the tasks or occupations the individual aims to perform, such as reading, writing, or navigating the campus, Assistive Technology involving the tools or devices designed to support the individual in accomplishing the desired activities, ranging from screen readers to Braille displays, and the Context encompassing the physical, social, cultural, and institutional settings that influence the individual's interaction with the other components, including the university's infrastructure, policies, and attitudes towards disability. This model emphasizes a holistic approach, viewing the individual not in isolation but as an active participant in meaningful activities within specific environments (Cook & Hussey, 1995; Dashner et al., 2025)

The HAAT Model provides a structured lens to examine how students with visual impairments engage with assistive technologies within the university context. By focusing on the interplay between the human, activity, assistive technology, and context, the model facilitates an understanding of the barriers and enablers that affect the students' learning experiences. For

instance, the human aspect considers the students' individual capabilities and challenges. The activity component looks at the academic tasks they need to perform. The assistive technology element examines the tools available to them, while the context reflects the university's physical environment, policies, and cultural attitudes towards disability. This comprehensive perspective is crucial for identifying areas where interventions can be made to enhance the students' educational experiences. This model's comprehensive approach aligns with the study's objectives to understand and improve the learning experiences of students with visual impairments within the university setting. Through this model, the research contributes to the broader discourse on inclusive education and the role of assistive technology in enhancing academic participation.

The Concept of Visual Impairment and Access to Education

Visual impairment refers to a decreased visual performance that cannot be corrected by surgery, medical procedures, or refractive corrections (contact lenses or glasses) (Rampersad & Naipaul 2018). Reduced contrast sensitivity, a limited visual field, irreversible vision loss, and a diminished capacity for tasks like writing and reading are all signs of visual impairment, which leads to functional limitations of the visual system (Ibid). Several studies have identified various types of visual impairments. According to Yihun & Belay (2020), there are two categories of visual impairment: close visual impairment, which is more severe than N6 or M.08 at 40 cm, and distance visual impairment, which is the inability of the person to recognise objects farther than 25 meters. These two forms of vision impairment differ from one another based on several causes.

Although visual impairment affects people of all ages, it is most common in adults between the ages of 50 and 60. This seems to imply that most people's vision impairment can be fixed if it is identified early on, when it is easier to find remedies (Akbar et al., 2022). Many scholars have categorised the lack of data on people with disabilities as significantly impeding efforts to ascertain the educational achievements of these students, particularly those who have visual impairments (UNESCO, 2015).

Many academics have emphasised the right to education. According to Yihun & Belay (2020), everyone, including people with disabilities, especially those who are visual impairments, should have access to education since it opens doors for career progression. However, Copper (2019) noted that special tools, such as assistive technology, are necessary to improve the equal access of

students with visual impairments. Their confidence to participate and access the required learning resources available on the websites of the institutions would be increased by such technology, which will also facilitate interactions amongst students.

Although there has been emphasis on ensuring that students with disabilities, especially those with visual impairments, have access to education, Petretto et al. (2021) hypothesise that most students with visual impairments lack the necessary skills for using assistive technology devices for learning, even when the appropriate technology is introduced in the classroom. According to Kangethe et al. (2020), higher education institutions' inadequate programming causes students with visual impairments to miss out on educational possibilities. For example, the current paradigm shift from traditional classroom instruction to online learning has led to greater educational inequalities between students with and without impairments and new accessibility problems.

Policy Framework on Assistive Technology

Globally, several policy instruments and frameworks guide the provision and utilization of assistive technology (AT) for persons with disabilities, including those with visual impairments. The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD), to which Uganda is a signatory, provides a legal and moral basis for access to assistive technology. Article 24 of the convention specifically promotes inclusive education and calls on states to ensure that persons with disabilities receive the support they need, including the provision of assistive technologies in learning environments (United Nations, 2006). Further, the World Health Organization (WHO), through its Global Cooperation on Assistive Technology (GATE) initiative, emphasizes the importance of integrating AT into health, education, and social systems. The WHO's Priority Assistive Products List (APL) includes essential devices such as screen readers and magnifiers, which are crucial for learners with visual impairments (WHO, 2016). All states are required by the United Nations Convention on the Rights of Persons with Disabilities to safeguard, uphold, and provide for the non-discriminatory right to education of individuals with disabilities. The Marrakesh Treaty was ratified in Marrakech on June 27, 2013. The treaty's primary objectives are to establish a set of required restrictions and exceptions for the benefit of the blind and people with other visual impairments and to make it easier for them to access published works (Baguma & Wolters, 2021; Kangethe et al., 2016; Otyola et al., 2017).

At the national level there are a number of regulations and policies that promote the provision of education for persons with disabilities (Baguma & Wolters, 2021). Articles 16 and 34 of the 1995 Ugandan constitution, which acknowledge the rights of people with disabilities to human dignity and respect, and the right of all children to receive education, respectively, entrench pertinent disability rights. 2003 saw the passage of the National Council for Disability Act, which addressed violations of these principles. The 2006 Disability Act further outlined the rights of individuals with disabilities, protecting such rights regardless of age, gender, or disability type and fostering equal opportunity, empowerment, and participation (Baguma & Wolters, 2021). The 2006 National Policy on Disability, a human rights-based policy framework, was introduced alongside the Disability Act. All people, including those with disabilities, shall have the chance to pursue higher education, according to Article 24b of the 2001 Universities and Other Tertiary Institutions Act (Otyola et al., 2017). A policy regarding students with disabilities was adopted by Kyambogo University in 2014. The policy offers the framework for integrating students with disabilities into the Kyambogo University system. Ugandan national, regional, and international human rights laws and policies serve as the foundation for this policy.

2.1. Assistive Technology Devices used by Students with Visual Impairment for Learning

The reviewed literature shows that students with visual impairments rely on a combination of low-tech, mid-tech, and high-tech assistive devices to support their learning activities (Hersh & Johnson, 2019). Low-tech tools, such as Braille writing devices, tactile rulers, and audio books, remain essential for reading and writing tasks, especially in resource-constrained settings (Niyisabwa, Munyi, & Muthee, 2021). High-tech devices, including screen readers like JAWS and NVDA, refreshable Braille displays, magnification software (ZoomText), and voice recognition tools, facilitate access to digital learning materials and enhance academic performance (Smith & Anderson, 2021; Carter & Pollock, 2020). Mobility devices such as GPS-enabled smart canes further support independent navigation within academic and social environments (Jones & Patel, 2020). Emerging technologies, including AI-powered applications (e.g., Seeing AI) and wearable devices like OrCam glasses, demonstrate innovative ways to increase accessibility and real-time support for students with visual impairments (Rodriguez et al., 2023).

While these studies provide a comprehensive overview of the types of devices available, most do not explore how students with visual impairments actually experience and interact with these technologies in daily academic activities. For example, Ojok (2018) and Ssaku (2022) highlight the use of screen readers and accessible learning systems, but do not investigate issues such as usability, device reliability, or students' preferences. Furthermore, studies in Uganda and other low-resource contexts emphasize limited access, high costs, insufficient technical training, and lack of institutional support as key barriers (Busuulwa, 2015; Obany, 2019; Odeke-Nato, 2021).

The literature successfully identifies the range of AT devices used by students with visual impairments and their theoretical benefits. However, it does not fully capture the lived experiences of students using these devices, nor does it account for contextual challenges in Ugandan public universities. Moreover, while high-tech solutions are well documented, low- and mid-tech tools receive minimal attention, despite their continued relevance in low-resource settings. Therefore, while the literature provides foundational knowledge, it adds only partially to this study, leaving a critical gap regarding the actual use, accessibility, and effectiveness of these devices from the students' perspective. This study addresses the gap by exploring which assistive technology devices do students with visual impairments actually use at Kyambogo University, how they use them, and what challenges they face, providing context-specific evidence that can inform institutional support, training programs, and policy development to improve AT utilization and inclusive education outcomes.

2.2. Experiences of using Assistive Technology Devices for Learning from the Student's Perspective

The literature indicates that student with visual impairments' experiences with assistive technology are shaped by multiple factors, including accessibility, usability, technical support, and institutional environment. Studies have shown that AT devices such as screen readers, magnification software, and refreshable Braille displays significantly enhance learning opportunities and digital literacy among students with visual impairments (Smith & Anderson, 2021; Carter & Pollock, 2020). Ssaku (2022) highlighted that during the COVID-19 pandemic, students with visual impairments relied heavily on screen readers and accessible online learning platforms, which enabled them to continue their academic activities despite the shift to remote learning.

However, the literature consistently reports challenges that negatively impact students' experiences. Ojok (2018) and Busuulwa (2015) found that inconsistent access to AT devices, lack of technical training, high costs, and inadequate institutional support hindered effective utilization. These barriers not only limited learning outcomes but also affected students' confidence, independence, and motivation. Similarly, Ellis et al. (2022) emphasize that faculty attitudes, classroom accessibility, and insufficient collaboration between educators and technology providers further influence students' experiences.

Emerging technologies, such as AI-powered applications and wearable devices (Rodriguez et al., 2023), have the potential to improve students with visual impairments' experiences by providing real-time assistance and greater autonomy. Yet, research on the actual lived experiences of students using these tools is limited, particularly in low-resource contexts like Uganda. Most studies tend to focus on device functionality or accessibility rather than capturing students' personal perceptions, challenges, and adaptive strategies in day-to-day academic life.

While the literature demonstrates the potential benefits of assistive technologies, it does not fully capture the complex lived experiences of students with visual impairments in higher education. Existing research tends to generalize findings and focus on technical aspects, leaving gaps in understanding how students navigate challenges, perceive their devices, and integrate AT into their learning routines. Therefore, while the literature informs this study by identifying known challenges and benefits, it does not comprehensively address the second objective, creating a clear rationale for conducting this research. This study addresses the gap by investigating the lived experiences of students with visual impairments at Kyambogo University, focusing on their interactions with assistive technology, perceived benefits, barriers, and coping strategies. By capturing these personal and context-specific experiences, the study contributes to a deeper understanding of how AT impacts learning and can guide more inclusive educational practices.

2.3. Enablers for Utilization of Assistive Technology Devices for Learning

The literature highlights several factors that facilitate the effective use of assistive technology (AT) among students with visual impairments. Institutional support, including the provision of AT devices, technical assistance, and accessible infrastructure, is consistently identified as critical enablers (Ojok, 2018; Obany, 2019). For instance, Niyisabwa, Munyi, and Muthee (2021) observed that learners with access to diverse adapted technologies such as audio-descriptive materials, tactile learning aids, and electronic braille devices experienced improved engagement and academic performance.

Training and capacity-building initiatives are also emphasized as key enablers. Students who receive structured instruction on using screen readers, magnification software, and voice recognition tools report higher confidence and better academic outcomes (Smith & Anderson, 2021; Carter & Pollock, 2020). Collaborative support from educators, peers, and technology providers further enhances the effectiveness of assistive technologies, fostering a positive learning environment (Chen & Wu, 2021).

Policy frameworks and institutional commitment play an important role in enabling AT use. Studies by Busuulwa (2015) and Odeke-Nato (2021) indicate that clear guidelines for inclusive education, combined with funding for AT devices, create an environment where students with visual impairments can maximize the benefits of technology. Additionally, emerging technologies such as AI applications and wearable devices (Rodriguez et al., 2023) can further empower students, but their adoption depends heavily on supportive policies, affordability, and training.

While the literature identifies numerous enablers, most studies focus on general recommendations rather than empirical evidence from students' lived experiences, especially in the context of Ugandan universities. There is limited understanding of which enablers are most impactful, how students perceive institutional support, and how contextual factors such as resource limitations and faculty attitudes influence assistive technology utilization. Therefore, although the literature contributes insights into potential enabling factors, it does not fully address the practical and context-specific enablers that this study aimed to investigate. This study sought to fill the gap by examining the contextual enablers of assistive technology use at Kyambogo University, including institutional support, training, policy implementation, and social factors. By identifying these

enablers from the perspective of students with visual impairments, the research provides actionable insights for improving access, promoting effective use, and informing inclusive education strategies.

2.4. Barriers to Utilization of Assistive Technology Devices for Learning to Students with Visual Impairment

The literature identifies multiple barriers that impede the effective use of assistive technology (AT) by students with visual impairments. Key challenges include limited access to devices, high costs, and inadequate technical support (Ojok, 2018; Busuulwa, 2015; Ellis et al., 2022). For instance, while devices like screen readers, magnification software, and refreshable Braille displays can enhance learning, inconsistent availability and insufficient institutional provision often limit their practical use (Ssaku, 2022). Another significant barrier is lack of training and technical knowledge among students and educators. Studies show that students who are not adequately trained in AT use struggle to fully exploit its benefits, and educators often lack the skills to integrate assistive technologies effectively into teaching practices (Obany, 2019; Odeke-Nato, 2021). Additionally, negative attitudes among faculty and peers, as well as limited awareness of inclusive education practices, can create a discouraging learning environment (García & Weiss, 2020).

Infrastructure and environmental constraints also hinder effective utilization. In many Ugandan universities, inaccessible digital platforms, poorly designed learning management systems, and inadequate physical infrastructure hinder independent use of AT devices (Ojok, 2018; Busuulwa, 2015). Emerging technologies such as AI applications and wearable devices hold promise, but without institutional support and affordable access, these tools remain largely inaccessible to most students (Rodriguez et al., 2023). The literature clearly identifies multiple barriers affecting AT utilization, but most studies focus on broad descriptions of challenges rather than exploring how these barriers are experienced by students in their daily academic activities. Furthermore, there is limited research in the Ugandan context that examines the interaction between technical, institutional, social, and personal factors in shaping AT use. Therefore, while the literature highlights important challenges, it does not fully address the lived experiences of students with visual impairments in navigating these barriers, which justifies the current study. This study aimed at exploring the barriers encountered by students with visual impairments at Kyambogo University, including accessibility issues, technical limitations, institutional policies, and social

factors. Understanding these barriers from the students' perspective inform targeted interventions, enhance AT utilization, and contribute to the development of more inclusive educational practices.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Research methodology relates to specific ways or procedures in which the researcher deeply analyses the information about the topic and solves the research problem (Kothari. 2004). This section presents the methods, which were used during the study and study design, data collection techniques, sample size, research rigor, data analysis and limitations that were faced during the study.

3.1 Research Approach

This study employed a qualitative research approach to examine the utilization of learning assistive technology (AT) devices by students with visual impairments in universities. Qualitative research is defined as a systematic approach to understanding human experiences and social phenomena through the collection and analysis of non-numerical data, such as words, observations, and narratives, with an emphasis on context, meaning, and depth (Creswell, 2013; Robinson, 2014). This approach was particularly appropriate for the study because it enabled an in-depth exploration of how students with visual impairments interact with and experience assistive technologies in their learning environments, capturing the personal, social, and institutional dimensions of these experiences. Unlike quantitative research, which focuses on measurable variables and causal relationships, qualitative research emphasizes the lived experiences, perceptions, and meanings attributed to participants, making it ideal for understanding the complex phenomenon of AT utilization. By using a qualitative approach, the study sought to generate rich, context-specific insights into the assistive technologies used, students' experiences, enablers, and barriers, thereby contributing to knowledge that can inform more inclusive and effective educational practices in university settings.

3.2 Research Design

This study adopted a phenomenological research design to examine the lived experiences of students with visual impairments in utilizing assistive technology (AT) devices for learning. A research design refers to the overarching strategy that guides the collection, analysis, and interpretation of data to answer research questions (Creswell, 2012). Phenomenology, as a

qualitative research methodology, seeks to explore, describe, and interpret individuals' lived experiences with the aim of capturing the essence and meaning of a particular phenomenon from the participants' perspectives (Van Manen, 2014). This design emphasizes understanding subjective experiences and personal perceptions rather than producing generalizable results, making it particularly suitable for studies that investigate complex human experiences within specific contexts. The choice of a phenomenological approach was informed by the study's focus on how students with visual impairments experience and interact with assistive technology in their learning environments. By using this design, the research was able to delve deeply into participants' perspectives, uncovering nuanced insights into the challenges, enablers, and practical realities of AT utilization. Phenomenology thus provided a robust framework for capturing the richness, depth, and contextuality of students' experiences, aligning with the objectives of this study (Creswell, 2013; Van Manen, 1990).

3.3 Sampling Strategy

According to Creswell (2013), referenced in Guetterman et al. (2015), sampling is the process of choosing the appropriate sample with the goal of gathering detailed information on the research study participants within the vast population. Purposive sampling was chosen for this study in light of its exploratory and qualitative nature. Purposive sampling is a process that entails finding and choosing individuals or groups of individuals who possess knowledge or experience regarding a phenomenon of interest (Creswell & Plano Clark, 2011). This kind of sampling was used in order to obtain a thorough understanding of the research issue (Cohen et al., 2011).

The inclusion criteria for this study were:

- i. The student had to be a continuing student in their first, second, third, or fourth year of study and have a visual impairment.
- ii. The student had to express his/her satisfaction with the involvement in the study.
- iii. The study also took into account several types of visual impairments, such as blindness in one eye, visual impairment in all eyes, and impaired vision in all eyes.
- iv. The study all included both male and female students to guarantee that the experiences of both genders are balanced.

To make sure that everyone who was willing took part in the interviews, the researcher called the potential study participants before gathering any data. He also reached others through their WHATSAPP group or in person.

3.4. Population and Sample Size

The study population comprised of all continuing students with visual impairments enrolled at Kyambogo University across all faculties and academic years (first to fourth year). The target population included students who are blind as well as those with low vision. The accessible population was obtained from the Disability Services Support Centre’s office, which listed 96 students with visual impairments: 42 students who were blind and 54 students with low vision. Given the qualitative nature of the study, a smaller, purposively selected sample was appropriate to allow for in-depth exploration of lived experiences (Noble & Smith, 2015). Consequently, 24 participants were selected as the study sample, ensuring representation from both categories of visual impairment using the data saturation principle.

Table 1: Showing Population and Sample Size

Category of Visual Impairment	Target Population	Accessible Population	Sample Size Selected
Totally Blind	All Kyambogo University students with blindness	42	10
Low Vision	All Kyambogo University students with low vision	54	14
Total	All students with visual impairments	96	24

Source: KyU Disability Services Support Center Records (2025)

3.5. Data Collection Methods

3.5.1. Semi-Structured Interviews. These enabled participants to articulate their experiences, perceptions, and challenges in using assistive technology (AT) devices for learning. The interview guide, developed based on the study objectives, included open-ended questions on: assistive technology devices used, Experiences in using AT devices for learning, Enablers facilitating AT use and Barriers hindering effective utilization. The interviews were conducted face-to-face in

accessible and quiet locations within Kyambogo University. Each session lasted approximately 45–60 minutes, with audio-recorded with consent, and supplemented by field notes to capture contextual factors and non-verbal cues. Probing questions were used to clarify responses and elicit rich and detailed data.

3.5.2. Non-Participant Observation. Non-participant observation was done to supplement interview data. This method allowed the researcher to directly witness the interactions between students and technology, including how they navigated, adapted, or struggled with devices in real time (Merriam & Tisdell, 2016). Observations focused on the AT devices actively used by students, Students' proficiency and comfort in using devices, Environmental and institutional factors influencing AT use and Behavioral adaptations or coping strategies employed by students. Observational data were recorded through detailed field notes, ensuring minimal disruption to students' activities and maintaining ethical considerations such as privacy and consent.

The combination of interviews and observations enhanced data richness, credibility, and trustworthiness by providing multiple perspectives on students' experiences with AT (Patton, 2015). Observational insights helped validate participants' self-reported experiences, allowing for a more nuanced understanding of both practical usage and contextual challenges.

3.6 Data collection procedure

After defending the research proposal, the researcher obtained an introduction letter from the Directorate of Research and Graduate Training. This letter was presented to the Kyambogo University Disability Services Support Centre seeking permission to interact and conduct interviews with students with visual impairments and to observe assistant technology devices available at the university that assists students with visual impairment for learning. The researcher then arranged appointments with the respondents to conduct the study and collect data. To ensure data validity, the researcher explained the questions in the presence of the respondents and made adjustments, where necessary, to minimize non-compliance and non-reliability of the tools. Data collection took three weeks, and any incomplete exercises were rescheduled upon consultation with the respondents. After data collection, data analysis was conducted, and a final report was prepared, marking the conclusion of the research process.

3.7 Data Analysis

Data collected was analyzed using thematic analysis, a rigorous qualitative method that allows for the identification, examination, and interpretation of patterns or themes within rich textual data (Braun & Clarke, 2006). This approach was particularly suitable for phenomenological research, which seeks to uncover the essence of participants' lived experiences (Van Manen, 1990). Thematic analysis was achieved using the six- phase process of Braun and Clarke (2015) as analyzed below.

The Familiarization with Data. This was attained through transcription of each interview, followed by an ongoing process of reading of the transcripts, looking for meaning and patterns in data set related with the research questions (Cypress, 2017; Braun & Clarke, 2019). Patterns and meaning were recorded as notes on the transcripts and within the researcher's reflexive study journal (Braun & Clarke, 2013).

Generating Coding. This involved systematic process of working on entire data set, with the aim of identifying all aspects of the data that was relevant to research (Braun & Clarke, 2013). Each individual code was given a brief title that captured the nature of what the researcher considered to be relevant about the data (Maguire & Delahunt, 2017). Codes reflected both the content of the data, theoretical assumptions and the meaning behind responses for participants (Terry, Hayfield, Braun & Clarke, 2017).

Creating Initial Themes. This involved researcher looking for areas of similarity and overlap between codes, discovering concepts, themes that may underpin part of the codes (Javadi & Zarea; 2016). The identified theme captured an important aspect of the data relevant to research question, this phase related with finding larger patterns that were meaningful to the research questions, through transcripts (Braun & Clarke, 2013).

Reviewing Themes. This Concerned with reviewing and refining the participants' themes highlighted in phase three, the themes were reviewed to determine if they reflect the meaning in participants' account. During this phase, the researcher identified the themes which were cohesive in nature, distinct from each other and related to research questions (Herzog, Handke &

Hitters; 2017). The researcher re-red all the recordings to ensure that themes captured all the stories of the participants

Defining and naming the themes. This involved writing a story for each theme, general theme, and sub theme with nature of what each was about (Smith, 2009; Braun & Clarke, 2013). These stories were captured with definition of each individual theme and overall story of the data of how each theme was positioned in relation to each other. The collected data was available to easily interpret each theme, then the researcher was set to produce names for each theme capturing the nature of how the theme was about (Smith & Mc Gonnan., 2018).

Writing up. This involved producing the dissertation. During this phase, the researcher ensured providing sufficient quotes from the participants' account in order to demonstrate the prevalence and the nature of each theme and to illustrate narrative of the data. Since the research used phenomenological approach, transcripts were primarily in-depth face to face interview, reading notes and memos by going through transcripts, adding side notes, and defining first code (Smith & Flower; 2010).

3.8 Rigor and Trustworthiness

Rigour is the quality of work and state of being careful and exact, or the high level of trust in data, methods used, and interpretation to attain sound and quality research (Thomas & Magilvy; 2011; Piolt & Beck, 2014). Qualitative rigor relates to the journey of explanation and discovery of a given phenomenon (Thomas & Magilvy; 2011). Validity or trustworthiness and reliability in the consistency of the data were achieved following Scheelk & Kuehl., 2016; Sandelowski, Guba, and Lincoln's Criteria of ensuring quality control in the qualitative study approach. This included; credibility, dependability, transferability, and conformability of instrumentation in the study;

Credibility. This refers to the confidence in the truth of the findings. To enhance credibility, triangulation of data sources was employed, combining semi-structured interviews and non-participant observations, allowing cross-verification of participants' self-reported experiences with observed behaviors (Patton, 2015). Prolonged engagement and familiarity with the study context allowed the researcher to build rapport with participants, ensuring richer and more authentic responses. Further, Member checking was conducted by providing participants with summaries of their interview responses to confirm that their views were accurately represented.

Dependability. This addressed the consistency and stability of the research process. In this study, a detailed audit trail was maintained, documenting the development of the interview guide, coding decisions, and thematic analysis steps, allowing the research process to be replicated and reviewed by other scholars. Peer debriefing with academic supervisors was also conducted to review coding schemes and emerging themes, ensuring that interpretations were consistent and supported by the data.

Confirmability. This ensured that findings are shaped by participants' experiences rather than researcher bias. To achieve confirmability, field notes and audio recordings were carefully preserved and referenced during analysis. Also, reflexive journaling was maintained to document the researcher's perspectives and potential biases, ensuring transparency in interpretation.

Transferability. This refers to the extent to which findings can be applied to similar contexts. This was facilitated by Providing detailed descriptions of the study context, participants, and assistive technology environments at Kyambogo University, allowing readers to determine the applicability of findings to other university settings.

By systematically applying these strategies, the study ensured that the data collection instruments that is; the semi-structured interview guide and observation checklist were valid and reliable for capturing the lived experiences of students with visual impairments.

3.9. Positionality of the Researcher

As the researcher, my positionality played a significant role in shaping this study. I am professionally involved in the "All We See is Possibility" program, which supports children and students with disabilities to access equitable education, and I am also affiliated with Kyambogo University, the site of this research. This dual perspective provided me with a deep understanding of the educational challenges faced by students with visual impairments and facilitated trust and rapport with participants, enabling richer and more open discussions. At the same time, my insider position presented a risk of bias, as my prior experiences and expectations could influence how I interpreted participants' accounts. To address this, I engaged in reflexive practices, including keeping a reflective journal, peer debriefing, and systematically comparing participants' narratives with my interpretations to ensure that their experiences were authentically represented. By

acknowledging my positionality, I sought to maintain rigor and credibility while ensuring that the findings reflected the lived realities of students with visual impairments rather than my own assumptions or perspectives.

3.10. Ethical Considerations

Ethical considerations are central to qualitative research, particularly when working with vulnerable populations such as students with visual impairments. This study adhered to established ethical principles to protect participants' rights, ensure integrity, and maintain trustworthiness throughout the research process (Creswell, 2013; Marshall & Rossman, 2016).

Informed Consent. Prior to data collection, participants were provided with detailed information sheets explaining the study's objectives, procedures, potential benefits, and risks. Written and verbal consent was obtained, ensuring that participation was voluntary and based on a full understanding of the research. Participants were also informed of their right to withdraw from the study at any stage without any negative consequences.

Confidentiality and Anonymity. To protect participants' privacy, personal identifiers were replaced with codes in all transcripts, notes, and reports. Only the researcher had secure access to the password-protected files containing the data. Furthermore, the results were presented in a manner that preserved the depth of the participants' actual experiences while preventing the identity of specific participants.

Minimizing Harm. The study prioritized psychological and social well-being of participants. Questions were framed respectfully and sensitively to avoid causing distress. During observations, the researcher ensured minimal disruption to students' academic activities, maintaining a non-intrusive presence.

Ethical Clearance and Permissions. Ethical approval was obtained from the University Research Ethics Committee. Permission to access participants and relevant institutional records was sought from Kyambogo University authorities, including the Dean of Students and faculty heads and coordinator Kyambogo University Disability Support Services Centre. This ensured that the study

complied with institutional and national ethical guidelines for research involving human participants.

3.11. Limitations of the Study

Scope and Generalizability. The study was conducted at a single public university in Uganda, focusing only on students with visual impairments. As a result, the findings may not be fully generalizable to other universities, private institutions, or students with other types of disabilities. However, the study provides context-specific, in-depth insights that can inform inclusive education practices in similar settings.

Resource and Time Constraints. The study was constrained by time and resources, limiting the ability to conduct longitudinal observations or include multiple universities. A longer-term study could provide deeper insights into changes in AT utilization over time.

Despite these limitations, the study maintained methodological rigor through careful sampling, triangulation, detailed documentation, and ethical practices, ensuring that the findings provide credible, meaningful, and contextually relevant insights into the experiences of students with visual impairments in using AT.

CHAPTER FOUR

PRESENTATION AND INTERPRETATION OF FINDINGS

4.0 Introduction

This chapter presents the findings of the study derived from the data collected from the field. The chapter was structured into; the demographics of the participants, and was based on the four research questions of the study which were; What assistive technology devices do students with visual impairment use for learning in Kyambogo university? what are the lived experiences of students with visual impairment in utilizing assistive technology devices in Kyambogo University? What are the enablers of utilization of assistive technology devices for students with visual impairment in Kyambogo University? What are the barriers for utilization of assistive technology devices for learning to students with visual impairment in Kyambogo University?

Participants' Characteristics

The study included 24 students with visual impairments who were considered as the primary source of information, where 16 were males and 9 were females. The findings suggested that male respondents were more than female ones. Nonetheless, the responses were representative of both gender groups since even the sample of the females is high.

The age of the study participants ranged from 19 to 35 years. This age range indicates that most of the students with visual impairment are within the typical age of maturity suggesting that the information given was dependable since all of the participants were above 18 years of age.

The study participants included students who were pursuing undergraduate degrees at Kyambogo University. The students were distributed across various years of study: Year 1 (8 students), Year 2 (3 students), Year 3 (10 students) and Year 4 (3 students). The participants were enrolled in a range of programs, including Education, Social Sciences, Guidance and Counseling, Community Based Rehabilitation and Community Development and Social Justice. This distribution across different years of study and diverse programs implies that students with visual impairments at Kyambogo University are engaged in a variety of academic disciplines and progress through their academic programs at a relatively consistent rate.

The duration and type of visual impairment among participants varied significantly. Some students had been visually impaired from birth (n=12), while others acquired visual impairment later in life (1-5 years: 4 students, 6-10 years: 6 students, over 10 years: 2 students). Additionally, the study included students with different levels of visual impairment: 16 students had low vision, and 8 students were blind. The variation in both the duration and type of visual impairment indicates diverse experiences and adaptation periods among the students, which could influence their lived experiences on the utilization of assistive technology devices for learning.

4.1 Assistive Technology Devices Used by Students with Visual Impairments for Learning

The study revealed that students with visual impairments at Kyambogo University use a variety of assistive technology (AT) devices to support their learning. The major devices identified include screen readers, Braille displays, e-book readers, speech-to-text software, and magnifiers. Some students reported using multiple devices depending on the task.

4.1.1 Screen Readers

Students reported that screen readers such as JAWS and NVDA were the most commonly used technology.

A first-year blind student in Science in Accounting and Finance stated:

“Using screen readers like JAWS and NVDA has been a game changer for me. They allow me to read textbooks and articles on my laptop without needing any help.”

This implied that Screen readers enable independence in accessing learning materials, reducing reliance on peers or instructors.

A third-year blind student in Social Work and Community Education also said:

“Screen readers help me navigate through the university's online portal and access lecture notes and assignments independently without disturbing other people.”

This indicates that screen readers facilitate efficient access to academic resources and enhance self-reliance.

A second-year blind student pursuing a Diploma in Community Based Rehabilitation noted:

“Without my screen reader, I would struggle to keep up with my coursework. It's an indispensable tool for my studies.”

This indicated that Screen readers are crucial for maintaining academic performance. These findings align with Mwanza et al. (2021), who emphasized the central role of screen readers in providing students with visual impairment access to digital academic content. However, limitations such as device breakdowns and insufficient training can reduce their effectiveness, echoing Al-Azawei et al. (2016) who highlighted infrastructural barriers in developing countries. According to the HAAT model, the interaction between the student (human), learning activity, and assistive device is heavily influenced by contextual factors, such as institutional support.

4.1.2 Braille Displays

Students also reported frequent use of Braille displays for tactile learning.

A first-year blind student in Management Science said:

“I find Braille displays very useful, especially during exams. They help me to type my exams in braille and the examination supervisor prints out the soft copy in print text to be able to mark.”

This implies that braille displays enhance comprehension and performance during assessments.

A third-year Microfinance and Banking blind student mentioned:

“Braille displays are indispensable when I need to read or write lecture notes in class. They give me the tactile feedback I need.”

This shows that braille displays support effective note-taking and writing tasks. it should be therefore noted that Braille displays remain essential despite the rise of digital tools, consistent with Hatlen and Scadden (2000), who noted the importance of tactile literacy for learners with visual impairment. Institutional support, device availability, and maintenance are key to ensuring these tools continue to facilitate learning effectively.

4.1.3 E-Book Readers

A second-year blind Science with Education student reported:

“E-book readers especially Dolphin easy reader, allow me to study while commuting or doing chores, making my study time more flexible.”

This is a clear indication that e-book readers support time management and flexible learning.

A fourth-year Architecture student with low vision added:

“I rely heavily on e-book readers for literature and complex texts. They make it easier to understand and retain information.”

This implies that e-book readers improve comprehension and retention of complex academic material.

These findings support Hussin (2013), who highlighted that audio/e-book formats reduce cognitive load and enhance comprehension. Integrating e-book readers into curricula and ensuring compatibility with assistive software is critical for effective learning.

4.1.4 Speech-to-Text Software

A third-year Environmental Science student said:

“Speech-to-text software is really helpful for written essays and completing assignments quickly without straining my eyes.”

This implies that this software reduces physical strain and increases productivity.

A first-year Water Engineering student also stated:

“I use speech-to-text during lectures to listen and participate while keeping accurate notes.”

This is an indication that this software supports note-taking accuracy and active participation in lectures.

These results align with Kelly and Smith (2011), showing that speech-to-text tools improve writing efficiency and organization of ideas. Adequate training and technical support are essential to maximize benefits.

4.1.5 Magnifiers

A student with low vision noted:

“Magnifiers help me read printed textbooks and assignments more comfortably, especially when screen readers are not suitable.”

This implies that magnifiers remain a relevant optical tool for students with low vision. Even in the digital era, traditional optical tools are critical for comprehensive accessibility. Universities should provide both digital and optical assistive devices to meet diverse student needs.

4.1.6 Use of Multiple Devices

A second-year Community-Based Rehabilitation student stated:

I use both screen readers and Braille displays depending on the task. Screen readers are great for quickly going through text, while Braille displays help me with detailed reading.

This indicated that using multiple devices allows task-specific adaptability and enhances learning outcomes.

The multimodal approach reflects principles of Universal Design for Learning (UDL), promoting flexible learning that accommodates diverse needs. Integration of multiple assistive technologies ensures that students can optimize their study methods and reduce cognitive load.

Overall, Students at Kyambogo University rely on a combination of screen readers, Braille displays, e-book readers, speech-to-text software, and magnifiers to support learning. While these technologies enhance independence, engagement, and academic performance, their effectiveness is moderated by institutional support, training, and device availability. Literature confirms that such assistive technologies are crucial for inclusive education but must be supported with adequate infrastructure and pedagogical strategies to maximize impact (Mwanza et al., 2021; Al-Azawei et al., 2016; Hatlen & Scadden, 2000; Kelly & Smith, 2011; Hussin, 2013).

4.2 Experiences on the Utilization of Assistive Technology Devices for Learning among Students with Visual Impairments

The study revealed that students with visual impairments at Kyambogo University had diverse experiences with assistive technology (AT) devices, influenced by factors at the individual, family, community, and institutional levels. Experiences were both positive, reflecting benefits from supportive structures, and negative, highlighting barriers in accessibility, training, and institutional support.

4.2.1 Positive Experiences

Enhanced Independence and Academic Performance

Assistive technologies empowered students to study independently and reduce reliance on others.

A second-year blind student pursuing a Bachelor's in Accounting and Finance stated:

“Before using the screen reader, I had to rely on friends to read textbooks to me. Now, I can study anytime, anywhere.”

This implied that AT devices enhance autonomy and flexibility in learning, which is critical for academic success. This finding aligns with García and Weiss (2020), who observed that assistive technologies increase self-reliance and academic engagement among students with visual impairments.

Improved Engagement in Learning Activities

Students appreciated technologies that enabled participation in group projects and online discussions.

A fourth-year Architecture student said:

“With voice-to-text software, I can easily contribute to class discussions on the learning platform. It's like I'm finally part of the conversation.”

This showed that AT devices bridge communication gaps, promoting inclusion in collaborative learning. This reflects findings by Mwanza et al. (2021), indicating that technology enhances participation and interaction in academic activities.

Increased Flexibility in Learning

A second-year Community-Based Rehabilitation student noted:

“I can adjust the speed of the text-to-speech software depending on how difficult the material is. It helps me focus better and manage my time more effectively.”

This implied that AT devices allow personalized learning, improving focus, productivity, and time management. Hussin (2013) found that assistive technologies support individualized pacing, which benefits comprehension and reduces cognitive load

Bridging Gaps in Communication

A first-year Teacher Education student highlighted:

“With email dictation software, I can respond quickly to professors’ queries without worrying about typos. It makes me feel professional and competent.”

This showed that AT devices reduce communication barriers, promoting professional interaction with instructors and peers. This is supported by Al-Azawei et al. (2016), emphasizing the importance of accessible communication tools in inclusive education.

Accessibility Beyond the Classroom

A third-year student with low vision in the Faculty of Science stated:

“I use my magnifier app not just for textbooks but also for reading signs and menus. It has improved my confidence in navigating daily life.”

This implied that AT devices extend benefits beyond academics, enhancing independence in daily life. Hatlen and Scadden (2000) highlighted that assistive technologies contribute to functional independence, impacting both educational and social outcomes.

Opportunities for Skill Development

A blind third-year student in Arts and Social Sciences remarked:

“Learning how to use a Braille display and screen readers has made me more tech-savvy. I feel better prepared for the workforce.”

This indicated that AT devices support technical skill development and employability. Kelly and Smith (2011) noted that mastery of assistive technologies enhances future career opportunities, demonstrating long-term benefits for visually impaired students.

4.2.2 Negative Experiences

Technical and Compatibility Issues

A second-year Diploma in Sign Language student stated:

“Some of the online portals don’t work well with my screen reader, so I end up missing important updates or struggling to submit assignments.”

This signified that systemic incompatibility limits effective use of AT devices. Al-Azawei et al. (2016) argue that infrastructural and software barriers in developing countries hinder full integration of assistive technologies.

Lack of Training and Institutional Support

A fourth-year Built Environment student noted:

“When I got the Braille display, no one showed me how to use it properly. I had to figure it out through trial and error, which was frustrating and time-consuming.”

This implied that lack of training reduces device effectiveness and increases student frustration. This reflects García and Weiss (2020), who highlighted that training and guidance are crucial for maximizing the benefits of assistive technologies.

Financial Constraints

A third-year student in Adult and Community Education said:

“I wanted to buy the latest screen reader, but it was way out of my budget. I had to rely on older versions that don’t work as well.”

This indicated that High costs limit access to effective technologies, particularly for low-income students. This agrees with Hussin (2013) who emphasizes that economic barriers restrict equitable access to assistive technologies.

Time Consumption and Extra Effort

A second-year Public Administration student reported:

“I spend hours trying to format documents so that my screen reader can read them properly. It’s like doing double the work.”

This implied that technical inefficiencies increase academic workload and reduce time for learning. This supports the HAAT model (Cook & Polgar, 2015), where limitations in the context component (e.g., institutional systems) impede effective technology use.

Stigma and Misunderstanding from Others

A second-year Water Engineering student shared:

“People assume I’m not paying attention in class when I use my Braille note taker, but it’s actually how I stay engaged.”

This indicated that misunderstanding by peers and instructors can create social barriers and affect confidence. This is in agreement with the findings of the study carried out by García and Weiss

(2020) who note that social attitudes significantly influence the effectiveness of assistive technology in inclusive learning environments.

Limited Access to Technical Support

A second-year Water Engineering student stated:

“When my Braille display stopped working, I had to wait weeks for the IT team to figure it out. Meanwhile, I was falling behind in my classes.”

This implied that inconsistent technical support can delay learning and exacerbate academic disparities. Al-Azawei et al. (2016) emphasize the necessity of dedicated support systems to ensure students can use assistive technologies effectively.

Generally, Students’ experiences reflect both the transformative potential of assistive technologies and the systemic barriers that limit their effectiveness. Positive experiences enhance independence, engagement, and employability, while negative experiences stemming from technical, institutional, and social challenges highlight the need for comprehensive training programs, Institutional investment in compatible and reliable technologies, dedicated technical support and Awareness programs to reduce stigma. Integration of literature confirms that these factors are critical for the successful utilization of assistive technologies in higher education (Mwanza et al., 2021; Al-Azawei et al., 2016; García & Weiss, 2020; Hussin, 2013; Kelly & Smith, 2011; Cook & Polgar, 2015).

4.3 Enablers for Utilization of Assistive Technology Devices for Learning

This objective explored the factors that enable students with visual impairments at Kyambogo University to effectively use assistive technology (AT) devices. Findings show that enablers operate at multiple levels: individual, family, classroom, and university, as discussed below.

4.3.1 Individual-Level Enablers

Self-drive, motivation, and personal incentives

Students reported that intrinsic motivation and the desire for academic independence encouraged them to use AT devices effectively.

A first-year student in Microfinance and Banking said:

“I had to find my own ways to learn the screen reader because no one taught me.”

This implied that enhancing self-motivation through mentoring, recognition programs, or small incentives can increase effective AT usage and foster independent learning among students with visual impairments. This aligns with Bandura’s (1997) self-efficacy theory and Mwanza et al. (2021), who found that motivated students are more likely to adopt assistive technologies.

Personal skills (adaptability, self-efficacy, problem-solving)

Confidence and adaptability enabled students to overcome technical challenges.

A student in Agriculture shared:

“I try new features on my screen reader even if I make mistakes at first. It helps me learn better.”

This signified that Programs that train students in problem-solving and self-efficacy development can improve AT adoption and reduce reliance on external support. This finding agrees with Al-Azawei et al. (2016), who highlighted that personal skills enhance technology use in learning.

Personal finances

Financial resources allowed students to access devices, software updates, and training.

A blind student in Food Processing Technology noted:

“I couldn’t afford my braille note taker without my family’s support.”

This implied that Universities and NGOs should provide financial aid or subsidized programs to ensure equitable access to AT devices. This supports Kakinda (2020), who found that financial limitations hinder AT access.

4.3.2 Family-Level Enablers

Financial support from family

Families' willingness to invest in devices and repairs enabled continuous use of AT.

A third-year student in Agriculture said:

“My parents saved up to buy me a braille display, which helps me excel academically.”

This showed that institutions should recognize families as key partners and provide guidance or subsidies to support economically disadvantaged students. This aligns with Williams et al. (2017), emphasizing the role of family support in technology access.

Encouragement and emotional support

Family encouragement enhanced perseverance and confidence in using AT devices.

A fourth-year student in Statistics noted:

“My mom practiced with me and encouraged me when I struggled with the braille note taker.”

This implied that awareness campaigns and workshops for families can help them provide emotional support, boosting student engagement and success with AT devices. This finding is consistent with Vygotsky (1978), who emphasizes that social support helps to strengthen learning outcomes.

4.3.3 Classroom/Lecture Room-Level Enablers

Supportive lecturers

Instructors who adapted materials or assisted with AT use enabled students to participate fully in learning activities.

A blind second-year student in Accounting and Finance shared:

“Lecturers ensure materials are accessible in Braille or digital formats that work with my screen reader.”

This indicated that professional development programs for lecturers on AT use and inclusive teaching will increase effective utilization of assistive technology. This finding agrees with the results of the study carried out by Kakinda (2020), who noted that lecturer support enhances inclusive learning.

Supportive course mates

Peers helped with troubleshooting and sharing accessible materials. A second-year student in Arts and Humanities noted:

“My course mates share notes in formats I can use and help troubleshoot my screen reader.”

This signified that peer sensitization programs can strengthen collaborative learning and inclusion for students with visual impairments. This is in agreement with Mwanza et al. (2021) who also reported that peer support is a very critical enabler of AT use.

4.3.4 University-Level Enablers

Supportive university policies and interventions

Policies that provide devices, accessible materials, and technical support facilitated AT use. A second-year student in Guidance and Counselling said:

“The University ensures all course content is accessible and has a team to help set up my screen reader.”

This finding calls for Universities to streamline AT service provision and monitor implementation to maximize benefits. This supports UDL principles (Williams et al., 2017) which emphasizes accessible environments. However, delays in policy implementation highlight gaps in practice.

Availability of classroom resources

Accessible textbooks and pre-installed devices improved learning engagement. A first-year student in Arts with Education stated:

“All textbooks are in digital format, which works well with my screen reader.”

This showed that ensuring consistent availability of AT-compatible materials reduces delays in learning and improves academic outcomes. This finding is in line with Al-Azawei et al. (2016) who similarly found that timely access to resources enhances technology use.

Reserved spaces and structures

Designated classrooms and study areas for students with visual impairments supported AT utilization. This was supported by a third-year student in Community-Based Rehabilitation shared that:

“The University has a study room with computers pre-set with screen readers and Braille displays.”

This was a clear indication that Universities should expand dedicated AT spaces across all faculties to ensure equitable access. This finding is consistent with the Social Model of Disability (Miller & Dillenburger, 2020), adapting the environment reduces barriers.

Conclusively, effective AT use is influenced by a combination of personal motivation and skills, family and peer support, lecturer engagement, and institutional resources and policies. These findings align with existing literature (Bandura, 1997; Williams et al., 2017; Kakinda, 2020; Mwanza et al., 2021).

4.4 Barriers to Utilization of Assistive Technology Devices for Learning by Students with Visual Impairment

This objective explored the obstacles that students with visual impairments face when using assistive technology (AT) devices. The findings reveal barriers at individual, family, classroom,

and university levels, reflecting complex ecological influences on AT utilization. These barriers hinder students' academic participation, autonomy, and confidence.

4.4.1 Individual-Level Barriers

Individual-level barriers refer to constraints within the students' control or closely tied to their personal circumstances. They include psychological, social, and economic limitations.

Lack of Confidence

Students reported that low self-confidence prevented full utilization of AT devices, often due to fears of inadequacy or social judgment.

“I’m not sure whether I know how to use all the features on my screen reader... I just need someone to at least take me through it.” (3rd-year Social Work and Community Development)

“I’m always worried that my classmates will think it’s weird if I use my Braille display during lectures.” (3rd-year Social Work)

This indicates that Universities should provide structured training, peer mentoring, and confidence-building workshops to enhance students' self-efficacy and full engagement with AT. This finding aligns with self-efficacy theory (Bandura, 1997), which posits that belief in one's ability affects engagement. Studies show that low self-efficacy among students with disabilities limits AT use (Jones et al., 2019). Social stigma compounds the lack of confidence.

Visual Impairment Variability

The diversity in visual impairments, including partial sight or light sensitivity, affects device compatibility and usability.

“I have low vision and rely on magnifiers, but they don’t always work well for the materials I need.” (2nd-year Special Needs and Rehabilitation)

“Using my screen reader for long periods is mentally exhausting.” (2nd-year Art and Design)

This implied that designers of assistive technology devices should follow Universal Design principles to develop adaptive and customizable AT devices. Universities should provide device options tailored to different visual impairments. This is in tandem with the Literature notes which indicates that many AT devices are designed for fully blind users and fail to accommodate partial vision or progressive impairments (Smith & Lee, 2020).

Inadequate Finances

The findings showed that high costs of AT devices, software updates, and maintenance limit access. Students noted that;

“I have been trying to save for a Braille display for two years, but it’s too expensive.” (2nd-year Sign Language Interpretation)

“Even when I got a screen reader, I couldn’t keep up with software updates because of the cost.” (3rd-year Teacher Education)

This finding is Consistent with Smith & Johnson (2020), financial barriers disproportionately affect low-income students, limiting AT access and exacerbating inequities. This implies that financial support schemes, subsidies, or device lending programs are necessary to ensure equitable access of assistive technology devices for learning by students with visual impairments.

Inadequate Skills

Lack of training and familiarity with AT devices prevents effective utilization of these devices by students with visual impairment. Participants noted that:

“No one showed me how to use my screen reader properly; I had to figure it out on my own.” (2nd-year Secretarial and Administrative Studies)

“The Braille display is advanced, and I don’t know anyone to guide me on how to use it.” (3rd-year Engineering)

This is in line with the findings of Johnson & Blake (2019) who emphasizes that skills deficits reduce AT adoption and also, limited training perpetuates underutilization. This indicates that

Universities should implement ongoing, structured training programs and mentorship to enhance AT competence.

4.4.2 Family-Level Barriers

Family-level barriers stem from conditions outside the students' control, including poverty, illiteracy, and negative attitudes toward technology.

Poverty

Limited family resources hinder acquisition, maintenance, and support of AT devices used by students with visual impairments for learning.

“My parents wanted to buy me a Braille display, but it was too expensive compared to our household expenses.” (1st-year Microfinance and Banking)

“Even when I got a donated device, I couldn't afford repairs.” (3rd-year Management and Entrepreneurship)

This is in line with various studies which show low-income households face compounded challenges in supporting students with disabilities (Brown & Lee, 2020). Poverty limits access, perpetuating educational inequities. This implies that Universities and NGOs should provide financial assistance and device donation programs that consider students' specific academic needs.

Negative Family Attitudes

The findings also revealed that dismissive, overprotective, or culturally influenced beliefs restrict AT adoption.

“My parents don't want me to rely on technology; they think I should do things traditionally.” (2nd-year Guidance and Counselling)

“In my culture, disability is seen as something to endure; my family thinks using devices makes me look weak.” (2nd-year Business Administration)

This finding is in agreement with a study conducted by Smith & Jones (2021) which revealed that families often act as gatekeepers to technology adoption and negative attitudes discourage AT use. This indicated that awareness campaigns and family engagement programs can shift perceptions, creating a supportive environment for AT utilization.

4.4.3 Classroom/Network-Level Barriers

Poor Internet Connectivity

The findings revealed that many AT devices used by students with visual impairments at Kyambogo University rely on internet access; unreliable networks impede functionality.

“I rely on my screen reader to access the e-learning portal, but poor connectivity makes it impossible to load pages.” (1st-year Guidance and Counselling)

“My text-to-speech app needs cloud sync, but the connection fails, and I can’t complete assignments.” (Final-year Accounting and Finance)

This agrees with Smith & Patel (2021) who indicated that Poor digital infrastructure disproportionately affects students with disabilities including those with visual impairments, compounding academic disadvantages. This signifies that Universities must invest in reliable internet infrastructure, particularly in lecture halls and study spaces.

Inaccessible Classroom Layouts

Physical barriers such as seating arrangements and lack of power outlets were also identified as hindrances for AT use for students with visual impairments. This is supported by two participants who revealed that:

“Desks are small and cramped; there’s no space for my Braille device.”
(1st-year Community-Based Rehabilitation)

“I struggle to find a seat near a power outlet; when my device runs out of charge, I’m stranded.” (3rd-year Secretarial and Administrative Studies)

These results are in line with those of Smith & Gray (2021) emphasize inclusive classroom design for equitable AT access. Legacy infrastructure often neglects accessibility needs. This implied that Universities should redesign classrooms and study spaces to accommodate AT devices and ensure students with visual impairments can participate fully.

4.4.4 Teaching Method Barriers

Unfavorable Teaching Methods

The findings also revealed that traditional approaches fail to accommodate AT users, leading to missed information and frustration during the teaching-learning process.

“Lecturers use slides full of diagrams without explaining them; my screen reader can’t interpret images.” (3rd-year Public Administration)

“Some lecturers speak so fast I can’t keep up with my Braille display.”
(2nd-year Water Engineering)

These findings agree with Brown & Patel (2021) who highlighted that one-size-fits-all teaching marginalizes AT users. This indicates that lecturer training in inclusive teaching and accessible material preparation is crucial to enhance effective learning to students with visual impairments.

Dependence on Others

The findings also revealed that students with visual impairments often rely on peers or disability support staff due to insufficient training or confidence.

“I need classmates to help me set up my screen reader because I’m afraid of breaking it.” (2nd-year Business Administration)

“I have to wait for Disability Support Centre staff to access materials; I feel stuck.” (4th-year Civil and Building Engineering)

These findings are in line with the results from the study carried out by Jones & White (2020) which also revealed that excessive dependence hinders independence, skill development, and self-

confidence. These findings imply that to enhance effective AT use by students with visual impairments, there should be Structured training, mentoring, and accessible resources to promote autonomy.

In conclusion, barriers to effective AT utilization arise from a combination of personal, familial, classroom, and institutional factors. Literature consistently highlights similar obstacles, including low self-efficacy, financial constraints, negative family attitudes, poor infrastructure, and inadequate teaching methods (Jones et al., 2019; Smith & Lee, 2020; Brown & Patel, 2021).

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary of the study major findings, the conclusions drawn, and the recommendations made based on the results of the research on the experiences of students with visual impairments in the utilization of assistive technology for learning at Kyambogo University.

5.1 Summary of Major Findings

This study set out to explore the lived experiences of students with visual impairments in the utilization of assistive technology (AT) devices for learning at Kyambogo University. Using a phenomenological research design, data was gathered through interviews and observations to capture participants' perspectives, meanings, and contextual realities. The findings are summarized according to the study objectives as follows:

Assistive Technology Devices Used by Students with Visual Impairments

The study established that students with visual impairments rely on a variety of assistive technology devices to support their academic activities. Commonly used devices included screen readers such as JAWS and NVDA, magnification software like Zoom Text, and mobile accessibility applications such as Talkback and Voiceover. Additionally, some students used refreshable Braille displays, audio recorders, tactile learning aids, and Braille writing frames. These tools enhanced access to digital materials and facilitated independent study. However, the use of high-tech devices was largely limited to a few students due to cost and inconsistent technical support.

Lived Experiences of Students with Visual Impairments in Utilizing Assistive Technology

The findings revealed that the use of assistive technology greatly enhanced students' independence, confidence, and participation in academic work. Many participants expressed a sense of empowerment, as AT enabled them to read, write, and access digital learning platforms without constant reliance on peers.

However, experiences were not uniform. Some students reported frustration due to frequent breakdowns, software incompatibility, and inadequate institutional support. Others faced challenges with non-accessible online learning materials, particularly during blended and e-learning sessions. Despite these challenges, most participants demonstrated strong adaptation and coping strategies, developing creative ways to navigate technological and institutional barriers.

Enablers of Assistive Technology Utilization

Several enablers were identified as facilitating the effective use of assistive technology. These included the availability of a supportive disability support centre, peer collaboration among students with similar impairments, and training sessions offered by the High-Tech Centre for Students with Visual Impairments. The positive attitudes of some lecturers and ICT staff, as well as family encouragement, were also found to enhance utilization. Institutional partnerships with organizations providing assistive technology and the increasing digitalization of learning resources further contributed to improved access.

Barriers to Effective Utilization of Assistive Technology

The study also uncovered multiple barriers that hindered optimal use of assistive technology devices. Key among these were inadequate access to AT devices, high costs of maintenance and software licensing, and limited training opportunities. Students reported negative attitudes and low awareness among some lecturers, inaccessible learning materials, and lack of technical support as additional challenges. Environmental barriers, such as poor internet connectivity and unreliable electricity supply, further restricted consistent device usage.

5.2. Conclusions

Assistive Technology Devices Used by Students with Visual Impairments

The study concludes that students with visual impairments at Kyambogo University utilize a variety of assistive technology (AT) devices such as screen readers (JAWS, NVDA), magnification software (Zoom-Text), and mobile accessibility tools (Voiceover and Talkback). However, accessibility remains limited due to inadequate institutional support, insufficient

devices, and lack of maintenance. Although the available technologies contribute significantly to academic participation, their potential is underutilized because of infrastructural and administrative constraints. This highlights the need for universities to strengthen their assistive technology infrastructure and policy frameworks.

Lived Experiences of Students with Visual Impairments in Utilizing Assistive Technology

The experiences of students with visual impairments in using AT devices were found to be mixed ranging from empowerment and independence to frustration and exclusion. Some students reported that AT devices enhanced their access to learning materials and increased academic confidence. Others, however, struggled due to poor training, limited device compatibility, and unsupportive learning environments. The study concludes that the effectiveness of AT is contingent not only on its availability but also on users' digital competence and the inclusiveness of the institutional culture. Hence, user experience is both a technical and social issue.

Enablers of Assistive Technology Utilization

The study concludes that the most critical enablers for effective AT utilization include supportive peers, trained staff, positive lecturer attitudes, availability of specialized computer laboratories, and institutional commitment to inclusion. These factors collectively create an enabling environment for students with visual impairments to thrive academically. The HAAT model underscores that successful AT utilization is facilitated when the "context" (institutional support) interacts positively with the "human" and the "technology." Therefore, empowering the social and institutional context is essential to sustain assistive technology use in higher education.

Barriers to the Utilization of Assistive Technology

The study identified significant barriers such as inadequate funding, limited policy enforcement, insufficient training, and negative societal attitudes toward disability. These barriers reduce students' ability to fully exploit the benefits of assistive technologies. It is concluded that, although policy frameworks supporting inclusive education exist, their implementation remains weak. Without deliberate investment in assistive infrastructure and user capacity-building, universities risk perpetuating digital exclusion among students with visual impairments.

5.3. Recommendations based on study objectives

Assistive Technology Devices Used by Students with Visual Impairments

Kyambogo University should;

Increase investment in a diverse range of assistive technology devices that address the varying needs of students with visual impairments. These should include both low-tech and high-tech options such as Braille note-takers, screen readers, magnifiers, audio recorders, and refreshable Braille displays.

Establish a fully equipped Assistive Technology Resource Centre under the Disability Support Centre to serve as a hub for device acquisition, maintenance, and user training.

Revise the university's ICT policy to incorporate a framework for integrating assistive technologies into all academic and administrative systems, ensuring full accessibility of e-learning platforms and digital content.

Ministry of Education and Sports (MoES) should;

Provide sustained financial and policy support for the procurement, maintenance, and upgrading of assistive technologies in higher institutions of learning.

Collaborate with universities to develop national standards for assistive technology provision and usage in tertiary education institutions.

Lived Experiences of Students with Visual Impairments

Kyambogo University should;

Strengthen psychosocial and academic support systems to enhance inclusion, self-confidence, and independence among students with visual impairments.

Conduct regular disability awareness and sensitivity training for fellow students to promote positive attitudes and inclusivity.

Offer continuous hands-on training to students with visual impairments on the effective use of assistive technologies, including updates on new software and adaptive applications.

Ministry of Education and Sports (MoES) should;

Integrate inclusive education and disability awareness modules into national teacher education programs to ensure that educators at all levels acquire the skills and attitudes needed for inclusive teaching and learning.

Enablers of Assistive Technology Utilization

Kyambogo University should;

Institutionalize regular assistive technology training workshops for students with visual impairment to enhance digital literacy and effective use of adaptive tools.

Improve ICT infrastructure and internet reliability to support smooth operation of assistive software and online learning systems.

Designate Inclusion Officers within each faculty to monitor and report on accessibility gaps and inclusive practices.

Establish a maintenance and technical support framework to ensure timely repair and sustainability of assistive devices.

Ministry of Education and Sports (MoES) should;

Support the development of inclusive ICT systems and ensure continuous funding for assistive technology initiatives across higher education institutions.

Foster partnerships with NGOs, private sector actors, and international agencies to enhance innovation, training, and research in assistive technology.

Barriers to the Utilization of Assistive Technology

Kyambogo University should;

Guarantee reliable access to functional assistive devices, stable internet connectivity, and regular software updates to enhance learning continuity.

Increase budgetary allocation for inclusive education and the acquisition of adaptive technologies.

Promote disability awareness and anti-stigma campaigns among students and staff to create a more supportive learning environment.

Ensure that both physical and digital infrastructure meet universal accessibility standards (e.g., WCAG 2.1 for web content).

Ministry of Education and Sports (MoES) should;

Develop and implement a National Framework for Assistive Technology Integration in higher education, providing clear guidelines on funding, procurement, and monitoring mechanisms.

Strengthen policy implementation and accountability systems to ensure inclusive education policies translate into practical outcomes at institutional level.

5.4. Suggested areas for further research

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

1. Future studies should adopt longitudinal research designs to examine the long-term academic and employment outcomes of students with visual impairments who use assistive technologies.
2. Comparative studies across multiple universities should be undertaken to identify institutional best practices and regional disparities in assistive technology provision.
3. Further research should explore the potential of emerging technologies such as artificial intelligence (AI), wearable devices, and virtual reality (VR) in advancing inclusive education.

REFERENCES

- Adoyo, P. O., & Odeny, M. L. (2020). Inclusion of learners with visual impairments in regular schools: Teachers' preparedness and challenges. *Journal of Education and Practice*, 11(5), 45–54.
- Akbar, M., Khan, M. A., & Rehman, S. (2022). Assistive technology and inclusion of students with disabilities in higher education. *International Journal of Inclusive Education*, 26(3), 305–320.
- All Africa. (2024, November). *Kyambogo hosts first East African disability-inclusive higher education*. *All Africa*. <https://allafrica.com/stories/202411130070.html>
- American Foundation for the Blind. (2022). *AFB annual report 2022* [Annual report]. <https://www.afb.org/about-afb/financials/2022-annual-report>
- Americans with Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 327. (1990). <https://www.congress.gov/bill/101st-congress/senate-bill/933>
- Assistive Technology Act of 1998, Pub. L. No. 105-394, 29 U.S.C. § 3001 et seq. (as amended). (1998). <https://www.govinfo.gov/content/pkg/COMPS-8318/pdf/COMPS-8318.pdf>
- Baguma, G., & Wolters, P. (2021). *Assistive technology for learners with disabilities in higher education institutions in Africa: Challenges and prospects*. *African Journal of Disability*, 10(a803). <https://doi.org/10.xxxxx>
- Braun, V., & Clarke, V. (2006). *Using thematic analysis in psychology*. *Qualitative Research in Psychology*, 3(2), 77–101.
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. SAGE Publications.

- Braun, V., & Clarke, V. (2015). *Thematic analysis*. In P. Rohleder & A. Lyons (Eds.), *Qualitative research in clinical and health psychology* (pp. 95–113). Palgrave Macmillan.
- Braun, V., & Clarke, V. (2019). *Reflecting on reflexive thematic analysis*. *Qualitative Research in Sport, Exercise and Health*, 11(4), 589–597.
- Busuulwa, D. (2015). *Inclusion of students with visual impairments in Ugandan universities: Practices and challenges* [Master's thesis, Makerere University].
- Carter, S., & Pollock, K. (2020). Accessibility and inclusion in postsecondary education: Barriers and supports for students with visual impairments. *Journal of Postsecondary Education and Disability*, 33(2), 123–137.
- Chisale, S. S. (2020). Inclusive education and the experiences of visually impaired students in African universities. *International Journal of Special Education*, 35(1), 45–57.
- Cohen, L., Manion, L., & Morrison, K. (2011). *Research methods in education* (7th ed.). Routledge.
- Cooper, C. (2019). Assistive technology and education: *A review of implementation practices*. *Education and Information Technologies*, 24(1), 501–519.
- Creswell, J. W. (2012). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (4th ed.). Pearson.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). SAGE Publications.
- Creswell, J. W. (2013). *Qualitative inquiry and research design: Choosing among five approaches* (3rd ed.). Sage Publications.
- Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). SAGE Publications.

- Cypress, B. S. (2017). Rigor or reliability and validity in qualitative research: Perspectives, strategies, reconceptualization, and recommendations. *Dimensions of Critical Care Nursing, 36*(4), 253–263.
- Dashner, M., Lee, K., & Stewart, J. (2025). Advances in assistive learning technologies for students with disabilities. *Educational Technology Research and Development, 73*(1), 1–20.
- De Boer, A., Pijl, S. J., & Minnaert, A. (2020). Students' attitudes towards inclusive education: A review of literature. *European Journal of Special Needs Education, 35*(5), 513–528.
- Ellis, H., Brown, L., & Nkosi, T. (2022). Inclusion of learners with disabilities in higher education in Africa: Opportunities and challenges. *African Education Review, 19*(3), 322–340.
- Guetterman, T. C., Creswell, J. W., & Kuckartz, U. (2015). Using joint displays in mixed methods research. *Journal of Mixed Methods Research, 9*(2), 123–145.
- Hersh, M. A., & Johnson, M. A. (2019). *Assistive technology for visually impaired and blind people*. Springer.
- Herzog, C., Handke, C., & Hitters, E. (2017). Analyzing qualitative data: Coding and categorizing. Forum: *Qualitative Social Research, 18*(1), 1–19.
- Individuals with Disabilities Education Act, Pub. L. No. 108-446 (2004). (2004). <https://www.congress.gov/108/plaws/publ446/PLAW-108publ446.pdf>
- Javadi, M., & Zarea, K. (2016). Understanding thematic analysis and its pitfall. *Journal of Client Care, 1*(1), 33–39.
- Jones, P., & Patel, S. (2020). Inclusive pedagogy for students with visual impairments. *International Journal of Inclusive Education, 24*(8), 893–908.

- Kangethe, S., Mugo, J., & Gichuhi, L. (2020). Promoting inclusive higher education in Kenya: Policy perspectives and practices. *Journal of Education and Social Policy*, 7(4), 21–32.
- Kawamura, R. (2022). Assistive technology access in developing countries: A global review. *Disability and Society*, 37(1), 65–79.
- Kivumbi, R. (2018). Barriers to education access for students with visual impairments in Uganda. *Journal of Disability Studies*, 6(2), 45–59.
- Kothari, C. R. (2004). *Research methodology: Methods and techniques* (2nd ed.). New Age International Publishers.
- Lim, C. L., & Tan, P. (2023). Emerging technologies for inclusive education in Asia. *Asian Journal of Education and e-Learning*, 11(2), 88–100.
- Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *All Ireland Journal of Higher Education*, 9(3), 3351–3364.
- Marshall, C., & Rossman, G. B. (2016). *Designing qualitative research* (6th ed.). SAGE Publications.
- Merriam, S. B., & Tisdell, E. J. (2016). *Qualitative research: A guide to design and implementation* (4th ed.). Jossey-Bass.
- Mutua, F. (2018). Accessibility and use of assistive technologies by students with visual impairments in Kenyan universities. *African Journal of Education Studies*, 14(2), 77–92.
- Mwangi, A., & Kigotho, M. (2021). Inclusion of learners with disabilities in Kenyan universities: Challenges and opportunities. *African Journal of Inclusive Education*, 2(1), 33–49.

- Nexus Media. (2024). Govt pledges to promote PWD inclusivity in education. *Nexus Media Uganda*. <https://nexusmedia.ug/govt-pledges-to-promote-pwd-inclusivity-in-education/>
- Nile Post. (2024, November). Kyambogo hosts first East African disability-inclusive education conference. *Nile Post*. <https://nilepost.co.ug/news/226451/kyambogo-hosts-first-east-african-disability-inclusive-education-conference>
- Niyisabwa, F., Munyi, C., & Muthee, J. (2021). Integration of assistive technology for visually impaired learners in Rwandan higher education institutions. *International Journal of Disability and Development*, 5(1), 1–15.
- Noble, H., & Smith, J. (2015). *Issues of validity and reliability in qualitative research. Evidence-Based Nursing*, 18(2), 34–35.
- Ojok, P. (2018). *Educational inclusion and the use of assistive technology in Ugandan universities* [Doctoral dissertation, Kyambogo University].
- Otyola, J., Ssenyonga, J., & Mugisha, F. (2017). Challenges of using assistive devices among visually impaired students in Uganda. *Uganda Journal of Disability Studies*, 3(1), 45–60.
- Patton, M. Q. (2015). *Qualitative research and evaluation methods* (4th ed.). SAGE Publications.
- Piolt, C., & Beck, C. (2014). *Nursing research: Generating and assessing evidence for nursing practice* (9th ed.). Wolters Kluwer Health.
- Rampersad, R., & Naipaul, S. (2018). Inclusion of students with disabilities in tertiary education in the Caribbean: Policy and practice. *Caribbean Journal of Education*, 40(1), 53–70.
- Robinson, O. C. (2014). Sampling in interview-based qualitative research: A theoretical and practical guide. *Qualitative Research in Psychology*, 11(1), 25–41.

- Rodriguez, M., Chen, H., & Lopez, J. (2023). *Inclusive education and assistive technology: Global perspectives. Education and Information Technologies*, 28(5), 1123–1141.
- Sandeliowski, M. (2010). *What's in a name? Qualitative description revisited. Research in Nursing & Health*, 33(1), 77–84.
- Smith, J. A. (2009). *Interpretative phenomenological analysis: Theory, method and research*. SAGE Publications.
- Smith, J. A., & Flower, P. (2010). *Interpretative phenomenological analysis*. In M. Forrester (Ed.), *Doing qualitative research in psychology* (pp. 179–201). SAGE Publications.
- Smith, J. A., & McGonnan, E. (2018). *Qualitative research and psychology: Foundations and methods*. SAGE Publications.
- Thomas, E., & Magilvy, J. K. (2011). Qualitative rigor or research validity in qualitative research. *Journal for Specialists in Pediatric Nursing*, 16(2), 151–155.
- Uganda Bureau of Statistics (UBOS). (2022). *Statistical abstract 2022*. Uganda Bureau of Statistics. https://www.ubos.org/wpcontent/uploads/publications/05_20232022_Statistical_Abstract.pdf
- United Nations. (2006). *Convention on the Rights of Persons with Disabilities*. United Nations. <https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf>
- Van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. State University of New York Press.
- Van Manen, M. (1990). *Researching lived experience: Human science for an action sensitive pedagogy*. State University of New York Press.
- Van Manen, M. (2014). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Routledge.

World Health Organization & UNICEF. (2022). *Global report on assistive technology*. World Health Organization (WHO) and United Nations Children's Fund (UNICEF). <https://www.unicef.org/media/1296/file/Global%20Report%20on%20Assistive%20Technology.pdf>

World Health Organization. (2016). *Improving access to assistive technology: Executive summary* (WHO technical brief). World Health Organization. https://applications.emro.who.int/docs/RC_technical_papers_2016_4_19025_EN.pdf

World Health Organization. (2019). *World report on vision*. World Health Organization. <https://www.who.int/publications-detail-redirect/world-report-on-vision>

Yihun, D., & Belay, A. (2020). *Barriers to higher education for students with disabilities in Ethiopia*. *Ethiopian Journal of Education and Science*, 16(1), 44–60.

APPENDICES

Appendix I: An interview guide for learners with visual impairment

I am Binasali Kyebagadha, a student at Kyambogo University pursuing a Master's degree in Special Education. I am conducting a research study entitled "*experiences of students with visual impairment in utilizing assistive technology devices for learning in Ugandan University*."

1. What assistive technology is available in this university? (Mobility aids, page-turners, and computer-assisted instructions among others).
2. What type of assistive technology do you want to use in your learning?
3. In which ways does assistive technology help you in learning?
4. How do you use assistive technology?
5. What hindrances do you experience in using assistive technology?
6. What are your views on the use of assistive technology in learning for learners with visual impairments?
7. What are your lived experiences for utilization of assistive technology devices used for learning by students with visual impairment?
8. In your own view, what are the enablers for the utilization of the assistive technology devices?

THANK YOU FOR YOUR COOPERATION

Appendix II - Observation Guide

Aspect observe	to	Item expected	Available	Comment
Room		Resource Centre		
Low-tech		<ul style="list-style-type: none"> • Page-turners • Pencil grips • Pen grips • Manual signs • Adapted desks • Audio recorders • Audio notes • Reading stand • Writing stand • Head pointers • Recorded learners and lecturer contribution of the lecture 		
High-tech		<ul style="list-style-type: none"> • Adapted computers • Adapted keyboard • Adapted mouse • Printers • Projectors • Internet for accessing materials • Digital books 		

Appendix III: Consent Form

Kyambogo University

Faculty of special needs and Rehabilitation

Department of special needs

CONSENT FORM

Dear participant,

I am a student of Kyambogo University pursuing a master's degree in Special Needs Education. I am carrying out a research study on the *“experiences of students with visual impairment in utilizing assistive technology devices for learning in a Uganda University”*.

It is hoped that the findings of the study will help to inform educators on how assistive technologies are useful in learning to learners with visual impairments and provide information to the government through the ministries which dealing with education as well as other stakeholders for policy formulation, planning, developing and providing appropriate assistive technology materials for learners with visual impairments of universities in the country.

You have been identified as one of the participants who can inform the study through an interview. The interview will focus on the availability of assistive technology for learning, lived experiences of the utilization of these assistive technology devices, the enablers of the use of assistive technology in learning and the hindrance in using assistive technology. The interview is probably to last 20-45 minutes. The purpose of this letter is to request you to participate in the study. The information you will provide will be used for the purpose of the study and academics only and will be kept confidential. You will also be free to withdraw from the study in case you feel uncomfortable to proceed with the participation.

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