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Factors influencing access to technology education programs for the visually impaired in higher learning institutions: a case of University of Nairobi.

Gathu, Susan
Strathmore Business School
Strathmore University

FACTORS INFLUENCING ACCESS TO TECHNOLOGY EDUCATION PROGRAMS FOR THE VISUALLY IMPAIRED IN HIGHER LEARNING INSTITUTIONS: A CASE OF UNIVESITY OF NAIROBI

Susan Gathu (64364)

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May, 2024

DECLARATION

I declare that this research dissertation is my original work and has not been previously submitted and approved by Strathmore University or any other Institution for the award of a degree. To the best of my knowledge and belief; this research project is original and borrowed materials has been done with due reference.

Susan Gathu (64364)

Sign…  ……. Date: 22.05.2024

Approval

This dissertation has been reviewed and approved for examination purposes.

Sign…  …… Date: 22.05.2024

Dr. Everlyne Makhanu

Supervisor, Strathmore University

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ABSTRACT

In Kenya, inclusive education takes into consideration people with physical disabilities but remains inaccessible to the visually impaired. In addition, while Technology Education Programs (TEP) have been improved to include people with physical disabilities, they have not taken into consideration the visually impaired. Institutions of higher learning in Kenya are behind in efforts to improve access to TEP among visually impaired individuals. Therefore, this study sought to examine factors influencing the accessibility of technology education programs among visually impaired individuals in institutions of higher learning in Kenya. The study sought to determine how the availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology influence the accessibility of TEP among the visually impaired in institutions of higher learning in Kenya. This study was anchored on the social justice theory, the theory of social constructivism and the technology acceptance model. The study adopted a pragmatism research approach. In addition, the study used both an explanatory research design and mixed methods research design. Specifically, the study made use of concurrent triangulation design. The target population was 410 visually impaired individuals who are undertaking different courses in the University of Nairobi, 2,786 visually impaired individuals who have completed different courses in the University of Nairobi in the last 5 years, 12 staff in the School of Computing and Informatics, 5 staff working in the Disability Resource Centre at the University of Nairobi as well as heads of the 5 PVI associations in Kenya. Since the population of staff in the School of Computing and Informatics, staff working in the Disability Resource Centre and heads of PVIs was small and census approach was used. Slovin's Formula was used in the determination of the sample size for the current visually impaired. The study used systematic random sampling in the selection of the study's sample size of 388 from the visually impaired. The research employed primary data collection methods, utilizing semi-structured questionnaires and a key informant interview guide. These instruments were designed to gather both qualitative and quantitative data. Qualitative data obtained from open-ended questions and key informant interviews underwent thematic analysis for a comprehensive understanding. On the other hand, quantitative data from the questionnaires was subjected to editing, coding, and entry into the Statistical Package for Social Sciences (SPSS version 22), a statistical software tool. Inferential statistics included Pearson correlation analysis and regression analysis. The study found that availability of trained staff had a

positive and significant effect on the access to technology education programs among the visually impaired. In addition, physical infrastructure had a positive and significant effect on the accessibility of technology education programs among the visually impaired. Further, the availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired. Also, the study found that availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired. The study recommends that staff members should receive training in disability awareness, specialized teaching methods, and the use of assistive technologies. The university should prioritize the installation of tactile surfaces and signage throughout the campus, including in classrooms, laboratories, restrooms, and common areas.

Keywords: Assistive technology, Institutions of higher learning, physical infrastructure, Technology Education Programs, Trained staff, visually impaired

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ABBREVIATIONS AND ACRONYMS

AT	Assistive Technologies
BI	Behavioral Intention
EARC	Educational Assessment and Resource Centre
ICT	Information and Communication Technology
IT	Information Technology
KIB	Kenya Institute for the Blind
KISE	Kenya Institute of Special Education
KSB	Kenya Society for the Blind
KUB	Kenya Union of the Blind
MYK	Maendeleo Ya Kipofu
NACOSTI	National Commission for Science, Technology & Innovation
PEOU	Perceived Ease of Use
PU	Perceived Usefulness
PVIs	People with Visual Impairment
PWDs	People with Disabilities
STEM	Science, Technology, Engineering, and Mathematics
SWDs	Students with Disabilities
TEPs	Technology Education Programmes
UNCRPD	United Nations Convention on the Rights of Persons with Disabilities
UNSREO	United Nations Standard Rules on the Equalization of Opportunities
UON	University of Nairobi
VI	Visual impairment
VMA	Vivekananda Mission Asram
ZOU	Zimbabwe Open University

DEFINITIONS OF KEY TERMS

Assistive technology	This encompasses a diverse array of equipment, software, devices or tools, specifically crafted to amplify the functional capabilities of individuals facing visual impairment (Kori & Mulla, 2021).
Institutions of higher learning	These are institutions offer advanced education and training beyond the secondary (high school) level and typically include universities, colleges, and other specialized institutions (Mahawariya, 2019).
Physical infrastructure	This refers to the built environment and facilities within educational institutions that impact the accessibility and overall experience of students with visual challenges (Kumari & Kaur, 2020).
Teaching and learning materials	This refers to a variety of resources and tools that educators use to facilitate the teaching and learning process among individuals with visual impairment (Holt, Gille & Supalo, 2019).
Technology Education Programs	This refers to educational initiatives and curricula that focus on teaching students the knowledge, skills, and principles related to technology and its applications (Lopez-Fernandez, 2021).
Trained staff	This refers to educational professionals who have received specialized training and acquired the necessary skills to effectively support and accommodate the needs of students with visual impairments (Yeo & Huan, 2019).
Visually impaired	This refers to individuals who have a significant degree of visual loss, ranging from partial vision to complete blindness (Kpodoe & Ampratwum, 2019).

CHAPTER ONE
INTRODUCTION TO THE STUDY

1.1 Background Information

In the 21st Century, education is considered a basic right for every individual regardless of their economic, racial, political, social, religious, or cultural background, and regardless of disability (Ndiweni, Machimbidza & Mutula, 2022). The United Nations Standard Rules on the Equalization of Opportunities (UNSREO) guarantees the right to education for people with disabilities (PWDs). It advocates that the education of PWDs be an integral part of the education systems of all member states (UNSREO, 2022). In addition, the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) indicates that state parties should ensure that PWDs can access adult education, vocational training, tertiary education as well as lifelong learning without any form of discrimination (UNCRPD, 2020).

Since the 1990's there has been significant growth in inclusive education in institutions of higher learning around the world (Silva & Pimentel, 2021). Some of the developed and developing countries have enacted laws and policies that protect the rights to education among PWDs (Ireri & King'endo, 2020). Around the world, in both developed and developing countries, including Kenya, institutions of higher learning have been adjusting their infrastructure to make them accessible to PWDs. However, as observed by Sahu (2020), 80% of potential learners, around the world, are not attending institutions of higher learning. In addition, when the provision of physically challenged is taken into consideration in the improvement of learning facilities, the visually impaired learners have been left out. Therefore, most of the institutions of higher learning do not have the required resources for facilitating the entry of visually impaired learners into their science, technology, engineering, mathematics, and technology programmes (Bell & Silverman, 2019).

Visual impairment denotes a notable decrease in vision that cannot be entirely rectified through the use of eyeglasses, medication, surgery, or contact lenses. It encompasses various degrees of vision loss, ranging from mild to severe (Kpodoe & Ampratwum, 2019). Visual impairment can result from a variety of eye conditions, diseases, injuries, or congenital disorders. According to the World Health Organization (2022), about 33 million people are blind and 260 million have

moderate-to-severe visual impairment. Though visual impairment affects the daily functioning and quality of life for individuals with this disability, many visually impaired individuals utilize technology and assistive tools to function competently in their personal, academic, and professional lives.

The integration and establishment of equal institutions of higher learning's opportunities for the visually impaired, around the world, faces challenges such as negative attitude of the public, architectural barriers, inadequate equipment or materials, education cost and high materials' cost invoiced for the effective teaching (Omede, 2019; Tom, Mpekoa & Swart, 2018). While different countries globally are at different levels of ensuring accessible education, visually impaired individuals face common challenges (Omede, 2019; Ndiweni, Machimbidza & Mutula, 2022). In the United States and Thailand, factors affecting the accessibility of different courses among the visually impaired in institutions of higher learning include the availability of assistive technology, the availability of instructors and the physical accessibility of learning facilities (Riley-Ancar, 2022; Chaichompu et al., 2022). Likewise, Silva and Pimentel (2021) noted that the educational inclusion of visually impaired individuals in higher education in Brazil hinged on factors such as the availability of material resources for visually impaired students, teacher training, infrastructure, and the overall teaching environment.

In Turkey, Firat (2021) revealed that the main factors affecting inclusive education among the visually impaired in institutions of higher learning include lack of learning materials, inaccessibility of lecture notes, inadequate library resources, access to physical infrastructure in the learning institutions. Zia, Khalid and Malik (2021) indicate that factors affecting students with visual impairments in institutions of higher learning in Pakistan include access to physical infrastructure, access to computers, availability of learning material and availability of assistive technology. Devi and Saxena (2019) established that inclusive education among the visually impaired in One Central University of India included deficiency of modern devices as well as challenges related to the accessibility of teaching and learning materials. However, due to differences in education policies, education infrastructure and policies related to inclusive education from one country to another, the findings of these assertions cannot be generalised to Kenya.

Some African countries have established legal frameworks and policies to promote accessible education for students with disabilities, including those who are visually impaired (Omede, 2019; Kpodoe & Ampratwum, 2019). One of the main challenges highlighted in Zimbabwe and Tanzania is limited or inaccessible infrastructure for visually impaired students (Ndiweni, Machimbidza & Mutula, 2022; Eligi & Mwantimwa, 2017). Similar to this, Kpodoe and Ampratwum's (2019) observed that in Ghana, teaching and learning materials are an important factor affecting access to information technology courses among visual impaired learners in public universities. In Tanzania, Chikukwa, Chabaya and Mupa (2022) and Eligi and Mwantimwa (2017) observed that while there has been an improvement in accessible education in the country, visually impaired learners in institutions of higher learning were still experiencing challenges related to infrastructure and availability of teaching and learning materials. However, different African countries have different inclusive education policies and the efforts towards inclusive education differ from one country to another.

In Kenya, the process of integration in institutions of higher learning is considerably affected by factors such as availability of instructional resources, learner-related factors, accessibility of physical facilities and educator-related factors. Similarly, Konga and Cheboi (2021) claim that institutions of higher learning in Kenya lack adequate resources like learning and instructor materials, which are important to visually impaired learners. Learning institutions also lacked support services for individuals who are visually impaired. In a study conducted at Kenyatta University, Oranga, Chege and Mugo (2020) observed that lack of qualified staff and social equipment were some of the factors hindering students with visual impairments from taking some courses such as Science, technology, engineering and mathematics (STEM) courses. According to Anyango and Okello (2023), inclusive education among visually impaired learners is negatively affected by the inadequacy of teaching and learning materials as well as teachers' attitudes. Oranga et al. (2020) established that institutions of higher learning in Kenya lack qualified staff trained to ensure the inclusion of visually impaired learners. However, these studies were limited to institutions of higher learning like Kenyatta University and public primary schools.

The Kenyan government has been working towards the implementation of inclusive education through various policy documents and legal frameworks. The Constitution of Kenya 2010 recognizes the right to education for every Kenyan child. Article 53 of the Constitution emphasizes

the need for access to quality and inclusive education for all children, including those with disabilities (Ireri, King'endo & Wangila, 2020). According to Abuya and Githinji (2022), increased government investment in education, spurred by Article 53, has led to improvements in infrastructure, teacher training, and curriculum development.

The Basic Education Act (2013) lays the foundation for the Kenyan education system and includes provisions for inclusive education. It mandates that the government should ensure that children with disabilities are provided with accessible and inclusive education. As indicated by Konga and Cheboi (2021), the Basic Education Act of 2013 has laid important groundwork for advancing inclusive education in Kenya. The Act mandates the allocation of resources for special needs education, including trained teachers, assistive technologies, and infrastructure modifications. However, the allocated resources for special needs education often fall short of actual needs, leading to inadequate teacher training, limited access to assistive technologies, and insufficient infrastructure adaptations.

Sessional Paper No. 1 of 2005 titled "A Policy Framework for Education, Training, and Research," this document provides guidelines and strategies for the development of an inclusive education system in Kenya. It outlines the government's commitment to providing equal opportunities for all learners. According to Oranga et al. (2020), the policy emphasizes the importance of providing equitable inclusive education for all Kenyans, including marginalized groups and those with disabilities.

The Education Sector Policy on Inclusive Education (2018) policy document outlines the government's commitment to inclusive education and provides a framework for implementing inclusive practices in schools. It emphasizes teacher training, infrastructure development, and the provision of learning materials to support children with disabilities. The policy strengthens the legal basis for inclusive education, aligning with the Constitution and the Basic Education Act. It emphasizes the principle of inclusion as the overarching goal for all learners with disabilities (Anyango & Okello, 2023).

The Kenya Institute of Special Education (KISE) established through Legal Notice No. 17 of 14 February 1986 is a key institution in Kenya responsible for training teachers and other education stakeholders in inclusive education strategies (Ministry of Education, 2009). It offers specialized

courses to equip educators with the necessary skills to support students with disabilities. KISE develops and disseminates resource materials, curriculum adaptations, and assistive technologies for students with disabilities. These resources support teachers in meeting the specific needs of their students and creating inclusive learning environments (Oranga et al., 2020).

1.1.1 Technology Education Programs

Technology Education Programs encompass a variety of educational initiatives and courses aimed at equipping individuals with knowledge, skills, and competencies related to technology and its applications. These programs typically cover a broad range of topics within the field of technology, including computer science, information technology, engineering, digital literacy, and other related disciplines. Technology Education Programs can vary in scope and focus, catering to different levels of learners, from basic technology literacy courses to advanced technical training programs. The ultimate goal of these programs is to empower individuals to effectively utilize technology, solve real-world problems, innovate, and contribute to the advancement of society in various domains.

Technology education programs encompass a range of educational initiatives and curricula designed to impart knowledge and skills related to technology, engineering, design, and problem-solving (Haleem, Javaid & Qadri, 2022). As per Lopez-Fernandez (2021), technology education programs involve the study of technology wherein students acquire knowledge and skills related to technological processes. These programs aim to equip students with the necessary tools to solve problems and enhance human capabilities through technology. Dudar, Riznyk and Kovtun (2021) observed that technology education programs refer to activities that seek to help students develop the knowledge, skills, and attitudes that will enable them to succeed in living and working in a technological society. Seale, Colwell and Olenik-Shemesh (2021) defined technology education programs as a set of learning experiences that integrates content and skills from science, technology, engineering and mathematics to address real-world challenges.

Different studies conducted in different parts of the word have looked at technology education programs in different ways. For instance, Rahimi and Martin (2020) observed that technology education involved preparing all students to use technology ethically, creatively, and responsibly to solve problems, communicate, and collaborate. In addition, Bahodirovich and Romilovich

(2021) observed that technology education programs are about the development of essential skills for the 21st century, including technology literacy, information fluency, critical thinking, and problem-solving using technology. In addition, Miranda and Molina (2021) established that technology education programs are about the development of technology literacy skills in areas like online research, coding, digital communication, and data analysis. In reference to descriptions by other authors as highlighted above, technology education programs, in this study, was looked at as initiatives and curricula designed to impart knowledge and skills related to technology, engineering, design, and problem-solving.

1.1.2 Factors Influencing Accessibility of Technology Education Programs

Technology education programs are influenced by different factors including the availability of trained staff, institutional infrastructure, availability of teaching and learning materials and assistive technologies (Riley-Ancar, 2022; Chaichompu et al., 2022). This is similar to Wasike (2019) observation that accessibility to technology education programs among the visually impaired is influenced by availability of physical infrastructure, availability of learning and teaching material, availability of assistive technology as well as adequacy of trained staff. Further, Amponsah and Bekele (2023) had earlier established that factors affecting the accessibility to education among the visually impaired was affected by access to technical-know-how, physical infrastructure challenges and inadequacy of assistive devices.

Among institutions of higher learning in Zimbabwe, Ndiweni, Machimbidza and Mutula (2022) observed that the main challenges facing students with disabilities included physical inaccessibility of facilities and lack of assistive technology. Similar to this, Omede (2019) noted that numerous higher education institutions in Nigeria are inaccessible to the blind due to a variety of obstacles, including intricately designed multi-story buildings with spiral staircases, open ravines, subpar restrooms, and an unfriendly atmosphere that restricts the blind's freedom of movement. Tom et al. (2018) established that in South Africa, lack of assistive resources and inadequate ICT infrastructure had a negative effect on the provision of visually impaired learners in Information Technology (IT) courses.

In Botswana, a shortage of specialized science teachers, teaching and learning materials were some of the main factors affecting access to science courses in institutions of higher learning among

visually impaired individuals (Habulezi, Batsalelwang & Malatsi, 2017). In Swaziland, Ferreira-Meyers and Pitikoe (2021) indicates that the main factors affecting accessible education among visually impaired in the University of Eswatini include lack of trained staff, inaccessibility of infrastructure as well as technological challenges that include incompatible devices. The study focused on four main factors influencing the accessibility of technology education programs among the visually impaired. These factors include availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology.

The availability of trained staff refers to the presence of individuals who have received the necessary education, training, and qualifications to perform specific roles or tasks within an organization or sector (Bell & Silverman, 2019). These individuals possess the knowledge, skills, and expertise required to carry out their job responsibilities effectively and contribute to the success and productivity of their respective organizations or fields. According to Ionescu (2023), the availability of trained staff in the field of education refers to the presence of qualified teachers, administrators, and support personnel who have undergone relevant training and professional development. Also, Moriña and Carballo (2020) observed that the availability of trained staff within an organization pertains to having a workforce with the necessary skills, knowledge, and experience to execute their job roles effectively. In this study, the availability of trained staff will be used to refer to the presence of qualified teachers and support personnel who have undergone relevant training and professional development to handle the visually impaired in technology education programs.

Institutional infrastructure refers to the framework of organizations, rules, regulations, and systems that provide the foundation for the operation and governance of institutions within a specific context (Ireri, King'endo & Wangila, 2020). Ndiweni, Machimbidza and Mutula (2022) defined that institutional infrastructure in education pertains to the physical and organizational components of educational institutions. It encompasses facilities, classrooms, libraries, curriculum development, and administrative processes that contribute to the delivery of education services. According to Omede (2019), institutional infrastructure in the context of technology comprises the organizational and technological systems that support the adoption and use of new technologies. This includes research institutions, innovation hubs, and regulatory bodies that foster technology

development. In the context of this study, institutional infrastructure will be used to refer to physical and organizational components such as facilities, classrooms and libraries in educational institutions.

Availability of teaching and learning materials refers to the presence and accessibility of a wide range of educational resources, tools, and materials that support the teaching and learning process (Kpodoe & Ampratwum, 2019). Chikukwa et al. (2022) defined teaching and learning materials as both physical and digital, such as textbooks, workbooks, educational software, laboratory equipment, audiovisual aids, online resources, reference materials, and more. Availability of teaching and learning materials refers to the provision of educational resources, including textbooks, instructional materials, and digital content, to ensure equitable access to quality education (Riley-Ancar, 2022). In this study, the availability of teaching and learning materials will be used to refer to the presence and accessibility of educational resources, tools, and materials that are specifically designed and adapted to meet the needs of individuals who have visual impairment.

Assistive technology is any device, system, or design that enables individuals to live better, more fulfilling, and more productive lives (Omede, 2019). These technologies help people with disabilities to achieve greater independence, engage in daily activities, and participate in society. As per the World Health Organization (2022), assistive technology is described as any object, device, equipment or system—whether commercially acquired, modified or customized—that is employed to enhance, sustain, or improve the functional abilities of individuals with disabilities. Assistive technology refers to a broad range of devices, services, and strategies that help individuals with communication and swallowing disorders engage in more meaningful interactions, access information, and participate in activities they value (Tom et al., 2018). In this study, assistive technology will be used to refer to a wide range of tools, devices, and software that provide access to information and support daily activities.

1.1.3 Overview of University of Nairobi

The University of Nairobi (UoN) is a comprehensive public university located in Nairobi, Kenya. Established in 1956 as the Royal Technical College, it became the University College of Nairobi in 1961, before attaining full university status in 1970. As one of the largest and oldest universities

in Kenya, UoN is renowned for its academic excellence, research contributions, and diverse student body (National Council for Persons with Disabilities, 2022). The university offers a wide range of undergraduate, postgraduate, and doctoral programs across various disciplines, including arts and humanities, sciences, engineering, health sciences, business, law, and agriculture. UoN's main campus is situated in the heart of Nairobi, with several satellite campuses and constituent colleges spread across the country. The university boasts state-of-the-art facilities, cutting-edge research centers, and partnerships with leading institutions globally. With a commitment to promoting innovation, leadership, and societal impact, the University of Nairobi continues to play a pivotal role in shaping the intellectual and socio-economic landscape of Kenya and beyond (University of Nairobi, 2023).

The accessibility of technology education programs among the visually impaired at the University of Nairobi is hindered by several factors. Primarily, the lack of trained staff proficient in adapting teaching methods and providing accommodations poses a significant challenge for visually impaired students (University of Nairobi, 2023). In addition, inadequate and inaccessible physical infrastructure, including pathways, signage, and facilities, impedes their mobility and navigation on campus. Furthermore, the scarcity of teaching and learning materials in accessible formats such as Braille or large print limits their ability to engage with course content (National Council for Persons with Disabilities, 2022). Moreover, the shortage of assistive technology resources, such as screen readers and Braille displays, further inhibits their participation in technology education programs. Addressing these challenges requires concerted efforts to provide training for staff, improve physical infrastructure, increase the availability of accessible materials, and invest in assistive technology tailored to the needs of visually impaired students, fostering a more inclusive learning environment at the University of Nairobi.

1.2 Problem Statement

Inclusive education plays a key role in providing equal opportunities and access to quality education for all students, including those with disabilities. It emphasizes the integration of students with disabilities into mainstream classrooms and school environments (Seale et al., 2021). In higher education, inclusive education ensures that individuals with disabilities, including the visually impaired have access to all education programs. It should lead to the development of infrastructural facilities accessible to the visually impaired, the adoption of

assistive technologies and the provision of teaching and learning materials accessible to the visually impaired. Inclusion education also ensures that there is adequate staff training in handling or guiding the visually impaired (Ndiweni et al., 2022). Therefore, with inclusive education, the visually impaired should access Technology Education Programs without any challenges.

Inclusive education through changes in physical infrastructure and adjustments in teaching methods mostly takes into consideration people with physical disabilities, but they remain inaccessible to the visually impaired. In addition, while Technology Education Programs have been improved to include people with physical disabilities, they have not taken into consideration the visually impaired. According to Muma and Obonyo (2020), there are 224,000 individuals in Kenya who are blind and 750,000 who are visually impaired. However, as observed by Oranga, Chege and Mugo (2020), out of all the learners with visual impairments that sit for the Kenya Certificate of Secondary Examinations, only 13% of them enrol for various courses in institutions of higher learning. According to Konga and Cheboi (2021), institutions of higher learning in Kenya lack teaching and learning materials and infrastructure, which are important to the visually impaired. In addition, Oranga et al. (2020) observed that the visually impaired lack of qualified staff and assistive technology.

Institutions of higher learning in Kenya have not made efforts to improve access to Technology Education Programs among visually impaired individuals. There is a need to the identification of factors influencing the accessibility of technology education programs among the visually impaired. In Kenya, several studies have been conducted on accessible education for the visually impaired. Anyango and Okello (2023) delved into the relationship between teachers' attitudes and the academic performance of visually impaired learners in primary schools within Rongo Sub-County. Adongo (2023) focused on the inclusion of students with visual impairment in teachers' training colleges in Machakos, Kenya. Konga and Cheboi (2021) examined how school resources influence the academic performance of visually impaired learners in integrated public primary schools in Baringo County.

While these studies provide perspectives and insights on broader matters of accessibility education in Kenya, there is limited data and studies on accessible education for visually impaired students in technology programs in institutions of higher learning in Kenya. For instance, Anyango and Okello (2023) study was limited to primary schools, Adongo (2023) study was

limited to teachers' training colleges in Machakos and Konga and Cheboi (2021) study was limited to public primary schools in Baringo County. Further, these studies utilized a descriptive research design and target population differ from one study to another. Therefore, this study sought to examine factors influencing the accessibility of technology education programs among visually impaired individuals in institutions of higher learning in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The general objective of the study was to examine factors influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

1.3.2 Specific Objectives

The specific objectives of the study were;

i) To determine the influence of availability of trained staff on the access to Technology Education Programs among the visually impaired in the University of Nairobi.
ii) To determine the influence of physical infrastructure on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi.
iii) To determine the influence of availability of teaching and learning materials on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi.
iv) To determine the influence of availability of assistive technology on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi.

1.4 Research Questions

i) What is the influence of availability of trained staff on the access to Technology Education Programs among the visually impaired in the University of Nairobi?
ii) What is the influence of physical infrastructure on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi?

iii) What is the influence of availability of teaching and learning materials on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi?

iv) What is the influence of availability of assistive technology on the accessibility of Technology Education Programs among the visually impaired in the University of Nairobi?

1.5 Scope of the study

The study focused on four main factors influencing the accessibility of technology education programs among the visually impaired. These factors include availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology. The study was conducted in the School of Computing and Informatics and the Disability Resource Centre at the University of Nairobi. The University of Nairobi is the largest university in Kenya in terms of number of programs, number of students and availability of facilities. The study also focused on PVI associations such as Kenya Union of the Blind (KUB), Kenya Society for the Blind (KSB), Maendeleo Ya Kipofu (MYK), Blind Empowerment Society of Kenya (DESK) and Kenya Institute for the Blind (KIB). Staff in the School of Computing and Informatics and the Disability Resource Centre at the University of Nairobi was included in this study because they understand various factors that affect the accessibility of Technology Education Programs among the visually impaired. In addition, PVIs were looked at in this study because they bring together visually impaired individuals and also play an important role in advocating for their rights. The target population was members of PVI associations as well as staff working in the School of Computing and Informatics and the Disability Resource Centre at the University of Nairobi.

1.6 Significance of the study

The management of institutions of higher learning in Kenya, policymakers, organizations related to PVIs as well as other researchers and academicians.

To the policymakers, the study provides in-depth insights into the challenges and barriers faced by visually impaired learners in accessing technology education programs in Kenya. This information can inform the development of policies and guidelines aimed at improving inclusivity and accessibility in the education sector.

To the management of institutions of higher learning, the study highlights various factors that affect the accessibility of technology education programs among the visually impaired. They can make use of these findings to prioritize and invest in necessary infrastructure improvements, such as ramps, accessible computer labs, and tactile signage. The findings can guide the management of institutions of higher learning in selecting and implementing accessible technology solutions that enhance the learning experience for visually impaired students. Management of institutions of higher learning can also use the study's findings to adapt course materials, teaching methods, and assessment practices that better accommodate visually impaired learners.

Other researchers and academicians can use this study's findings as research material and in the identification of research gaps in related studies. Also, researchers can build upon the findings, methodology, and recommendations of the study to conduct further investigations or studies in related areas. In addition, the study identifies gaps in the literature and areas for further research, guiding future investigations into related topics. Researchers and academicians can build upon the findings of this study to explore new avenues for improving accessibility and inclusivity in technology education programs. To other researchers, scholars and academicians, the research contributes to the advancement of social justice by advocating for equal access to quality education for all students, regardless of disability.

Disability Support Services including PVI associations, the study's findings serve as powerful advocacy tools. They can use the research to advocate for policy changes, increased funding, and improved support services in the education sector, specifically related to technology education programs. PVI associations can use the study's findings to raise awareness among the public, policymakers, and educational institutions about the unique needs and challenges faced by visually impaired learners in technology education.

1.7 Chapter Summary

This chapter covers an introduction to the study that begins with a global perspective, regional perspective and local perspective on accessibility of technology education programs among the visually impaired in institutions of higher learning. This is followed by an overview of policy framework for technology education programs in inclusive education. The chapter also presents

problem statement, research objectives, research questions, scope of the study, significance of the study and limitations of the study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter presents a literature review on factors influencing the accessibility of technology education programs among the visually impaired. The chapter covers a theoretical review of the literature, an empirical review, and summary of the literature, research gaps and a conceptual framework.

2.2 Theoretical Review

A theory is a systematic and coherent framework of ideas or principles that seek to provide an abstract or conceptual understanding of a particular domain or concept (Devi, 2019). It often involves a set of assumptions and propositions used to make sense of complex phenomena or philosophical questions. This study will be anchored on the social justice theory and technology acceptance model. Combining these theories allows for a more holistic understanding of inclusive education. Social Justice Theory brings attention to systemic issues and policy considerations, and TAM delves into individual attitudes toward technology adoption (Nilholm, 2021; Demchenko, Maksymchuk & Kalynovska, 2021). Applying TAM to inclusive education involves examining how teachers and students perceive the usefulness and ease of use of technology tools designed to create inclusive learning environments (Slee & Allan, 2020). In addition, combining of these theories helps in addressing the limitations of each of the theories.

2.2.1 Social Justice Theory

The Social Justice Theory was developed by John Rawls in the year 1985 (Rawls, 1985). Social Justice theory is a framework that seeks to address and rectify societal inequalities and promote fairness, justice, and equality in the distribution of resources, opportunities, and benefits within a society. This theory is concerned with identifying and addressing various forms of social, economic, and political injustices, particularly those that disproportionately affect marginalised or disadvantaged groups. Social justice theory has evolved over time and encompasses a range of

ideas and perspectives, but it generally aims to create a more just and equitable society (Joseph, 2020).

The main tenets of the social justice theory include equality and equity, fair distribution, non-discrimination, accessibility, and inclusivity (Capeheart & Milovanovic, 2020). The social justice theory emphasizes the importance of both equality and equity. The theory also advocates for the fair distribution of resources, opportunities, and benefits within a society. It calls for reducing disparities in education and other areas to ensure that no one group is systematically disadvantaged. Social justice theory also condemns discrimination based on characteristics such as disability. It seeks to eliminate prejudice and biases that contribute to social inequalities. Further, the theory underscores the importance of creating accessible and inclusive systems and institutions, ensuring that everyone, regardless of their background, has equal inclusive education, employment, healthcare, and other essential services.

Social justice theory calls for the elimination of discrimination based on disability. It posits that institutions should actively work to eliminate biases and systemic barriers that hinder visually impaired students' participation in technology education programs. The theory stresses the importance of creating accessible and inclusive environments (Adli & Chowdhury, 2021). In this context, it means that physical infrastructure should be designed with the needs of visually impaired students in mind. This includes accessible pathways, tactile signage, and other accommodations. Social justice theory recognizes the role of assistive technology in levelling the playing field. It posits that institutions should invest in and make available assistive technologies that support visually impaired students in their education.

The study used social justice theory to explain factors influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. Social Justice Theory stresses the importance of providing equitable educational opportunities. The presence of adequately trained staff who understand the needs of visually impaired students is crucial for ensuring that these students receive the support and instruction they need. Trained staff can offer specialized teaching methods, adapt materials, and provide necessary accommodations, fostering an inclusive learning environment. Ina addition, social justice theory advocates for the removal of barriers that prevent individuals from accessing essential services. In

the context of higher education, this means ensuring that buildings and facilities are accessible to visually impaired students (Capeheart & Milovanovic, 2020). This includes features such as ramps, tactile paving, Braille signage, and accessible restrooms. An inclusive physical infrastructure is vital for allowing visually impaired students to navigate campuses independently and safely.

According to Social Justice Theory, resources should be distributed in a manner that addresses the needs of all individuals, particularly those from marginalized groups. For visually impaired students, this means providing textbooks in Braille, audio formats, and other accessible formats. It also involves ensuring that learning management systems and digital resources are compatible with screen readers and other assistive technologies. Access to appropriate teaching and learning materials ensures that visually impaired students have the same opportunities to learn and succeed as their sighted peers (Adli & Chowdhury, 2021). This aligns with the principle of equality of opportunity, a core aspect of social justice. Also, social justice theory supports the use of technology to bridge gaps and promote inclusion. Assistive technologies such as screen readers, magnification software, Braille displays, and other adaptive tools enable visually impaired students to access digital information and participate fully in educational activities. The provision of assistive technology helps to remove barriers that visually impaired students face in accessing information and participating in learning activities.

Social Justice Theory has been used by several authors in studies related to disability and inclusive education. For instance, Polat (2011) explored the theoretical connections between inclusion in education and social justice, drawing on Martha Nussbaum's capability approach as a framework that integrates disability/impairment into the discourse on social justice. Terzi's (2005) study introduces elements of a capability perspective on impairment and disability, proposing a multidimensional and relational understanding of disability. The capability perspective is introduced as providing novel and foundational insights into the conceptualization of impairment and disability. It addresses the tension between natural and social causal factors in ongoing discussions about disability and education. The argument highlights the innovation of the capability approach in assessing equality by centering on human diversity. The research proposes that the envisioned comprehension of human diversity, the advocacy for democratic decision-making processes, and the normative explanation of disability have the capacity to steer educational theory and inclusive education policies in beneficial directions.

In a study conducted in Pakistan, Slee (2001) underscores the significance of inclusive education within the broader scope of educational research. Despite the growing emphasis on social inclusion aligning with aspirations for social justice, the study contends that inclusive education remains fragile as a means of challenging traditional views of special educational needs. Instead, it advocates for a perspective that focuses on educational disablement as a form of identity politics. The research advocates for a thorough scrutiny of the constraints within social justice research in education pertaining to disabled students. In this concise dialogue, the aim is to present various issues connected to the intersection of education and disability politics.

Social justice theory, like any theoretical framework, is not immune to criticism. Some of the critiques argue that the concept of social justice is subjective and lacks a clear, universally agreed-upon definition (Thrift & Sugarman, 2019). This ambiguity can lead to challenges in practical implementation and measurement. Other critics contend that social justice theory places too much emphasis on achieving equality of outcomes, potentially at the expense of individual effort and merit (Capeheart & Milovanovic, 2020). This may lead to concerns about incentivizing hard work and innovation. Also, other critics argue that implementing social justice policies can be challenging due to the complexity of societal structures and the potential unintended consequences of interventions (Watts & Hodgson, 2019). Practical implementation may not always align with theoretical ideals.

2.2.2 Technology Acceptance Model

The Technology Acceptance Model was developed by Fred D Davis in the year 1989 (Davis, 1989). The model is often used to predict and understand users' intentions and behaviors regarding the adoption of new technologies, including information systems, software applications, and digital tools (Kemp, Palmer & Strelan, 2019). The core components and concepts of the Technology Acceptance Model include Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Behavioral Intention (BI) and Actual System Use (U). Perceived usefulness encompasses the degree to which an individual believes that employing a specific technology will improve their job performance, productivity, or effectiveness. On the other hand, perceived ease of use is the extent to which an individual believes that using the technology will be uncomplicated and free from effort. It evaluates the user's perception of how easy or difficult it

is to learn and use the technology (Granić & Marangunić, 2019). Behavioral intention represents an individual's intention or readiness to use a particular technology. It is a key precursor to actual technology usage. High behavioral intention implies a greater likelihood of technology adoption. Actual system use refers to the real, observed behavior of individuals using the technology. This is the concrete utilization of the technology as opposed to mere intention.

Visually impaired students may perceive the availability of assistive technology, such as screen readers, Braille displays, or text-to-speech software, as highly useful (Kemp, Palmer & Strelan, 2019). When such technology is available, students are more likely to believe that it will enhance their learning and accessibility to technology education programs. The perceived ease of use of assistive technology is critical. If visually impaired students find the technology easy to use, they are more likely to embrace it as a tool to access and engage with technology education programs effectively. The availability of assistive technology strongly influences the behavioral intention of visually impaired students. When such technology is accessible, students are more likely to intend to use it for their education, as they perceive it as a valuable resource (Kamal, Shafiq & Kakria, 2020). When assistive technology is available and perceived as useful and easy to use, visually impaired students are more likely to actually use it for accessing technology education programs.

Technology Acceptance Model was used in explaining the impact of Technology Education Programs on the visually impaired as well as the effect of availability of assistive technology on accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. Visually impaired students' assessment of the usefulness of technology education programs can be influenced by their academic achievements, increased accessible educational resources, and improved digital skills. If visually impaired students find these programs easy to navigate, interact with, and comprehend, they are more likely to engage in learning activities and adopt technology more effectively (Granić & Marangunić, 2019). In addition, positive attitudes toward these programs and a strong intention to use them can indicate the program's impact on students' motivation and readiness to learn through technology.

In their study, Nam, Bahn, and Lee (2013) employed the Technology Acceptance Model to explore the acceptance of assistive technology among special education teachers in Thailand. The study aimed to scrutinize the acceptance of assistive technology (AT) among special education teachers,

emphasizing critical determinants such as facilitating conditions, perceived ease of use, computer self-efficacy, result demonstrability, perceived usefulness, and behavioral intention. The findings validated the hypothesized relationships within the conceptual model of AT acceptance. Notably, perceived usefulness emerged as a predominant factor influencing AT usage. Facilitating conditions exhibited a strong correlation with perceived ease of use, and the latter significantly impacted computer self-efficacy. The study underscored the significance of result demonstrability, showcasing notable effects on both computer self-efficacy and perceived usefulness.

Hafit, Othman and Sharie (2020) investigated the impact of perceived usefulness and perceived ease of use on employers' acceptance of this technology for disabled employees, employing Davis' Technology Acceptance Model (TAM). Data from 35 employers in Micro Enterprises organizations were collected through online questionnaires, with a mix of current employers of disabled workers, those expressing interest in hiring people with disabilities (PWDs) in the future, and those uninterested in hiring disabled workers. The analysis, performed through Partial Least Square Structural Equation Modeling (PLS-SEM), substantiated two hypotheses, affirming a positive and substantial correlation between perceived ease of use and perceived usefulness. Additionally, the study identified a relationship between perceived usefulness and technology acceptance. These findings provide valuable insights for employers seeking to improve the capabilities of their disabled workforce, contributing to the expansion of employment opportunities for individuals with disabilities.

The Technology Acceptance Model (TAM) has been widely used to understand and predict individuals' acceptance and adoption of technology (Malatji & Zuva, 2020). However, like any theoretical framework, TAM is not immune to criticism. TAM is often criticized for its simplicity and narrow focus on a limited set of variables. Some argue that it may not fully capture the complexity of factors influencing technology acceptance, like in the use of assistive technology (Scherer, Siddiq & Tondeur, 2020). In addition, TAM primarily focuses on users' behavioral intention to use a technology rather than actual use. Critics argue that the link between intention and behavior is not always straightforward, and users may have intentions that do not translate into action (Lewis & Šumak, 2020). Critics also argue that TAM may not adequately account for cultural and contextual variations in technology adoption. Cultural differences and variations in contexts may influence the relevance and applicability of TAM across diverse populations.

2.3 Empirical Review

This section presents empirical literature on the effect of the availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology on accessing technology education programs by the visually impaired.

2.3.1 Trained Staff and Access to TEPs among the Visually Impaired

Yeo and Huan (2019) conducted a study on teachers' experience with inclusive education in Singapore. The study involved 202 teachers from 41 resourced primary schools in Singapore. The researchers conducted focus group interviews and used Interpretive Phenomenological Analysis and NVIVO software for transcription and coding. From the findings, teachers reported stress arising from challenging behaviors exhibited by students. Instructional difficulties in catering adequately to diverse needs in the same classroom were a significant source of stress for teachers. The study emphasized the importance of classroom practices that facilitate inclusion. Training was identified as valuable in shaping teachers' attitudes towards inclusion, suggesting that professional development plays a crucial role in supporting teachers in inclusive education settings.

In their study, Ferreira and Manis (2022) examined the role of availability of trained staff in addressing equity for learners with visual impairment among schools in South Africa. The study utilised a case study design and collected data from ten special needs schools and seven full-service schools from 5 provinces in South Africa. The findings indicated that teachers were not sufficiently prepared to fulfil this responsibility as they had not received special training on working with visually impaired learners. It was also observed that in-service training for teachers might not be sufficient was a common concern. Teachers require in-depth knowledge and skills to effectively implement inclusive education.

In Namibia, Josua et al. (2022) examined various challenges facing the inclusion of learners with visual impairments in schools. The study used a qualitative design and a stratified-purposive sampling technique was used in the selection of the sample size. Data collection tools included an observation schedule and an interview guide. The study findings indicated that one major challenge highlighted was the lack of training for school staff. This was found as a significant

barrier to effective inclusive education, not only for learners with visual impairments but also for students with disabilities more broadly. The absence of continuous training for school staff also hinders the achievement of inclusive education objectives. In addition, without proper training, educators struggle to adapt their teaching methods, materials, and classroom environments to accommodate the needs of diverse learners. As a result, students with visual impairments may not receive the necessary support and accommodations to fully participate in the educational process.

Silas et al. (2022) examined the role of specialist teachers in the effectiveness of Inclusivity in Technical Education among the visually impaired learners in Mashonaland East Province of Zimbabwe. The study utilized a descriptive survey design and data was collected by use of an interview guide and questionnaires. The results revealed that the integration of students with low vision into the instruction of technical subjects was not efficiently carried out, primarily because most teachers lacked the training to address the needs of learners with special educational requirements, particularly the visually impaired, during their college or university education. Furthermore, specialist teachers faced challenges in dedicating time to professionally develop their colleagues, resulting in subject teachers remaining ineffective and inadequately skilled.

Dea and Negassa (2019) investigated the impact of teachers' qualifications, training, and experience on their attitudes towards the inclusion of visually impaired students in secondary schools in Southern Ethiopia. The study utilized a mixed-methods approach with triangulation, integrating quantitative data collected through questionnaires with qualitative data obtained from focus group discussions. The findings indicated that qualification training, and experiences were found to have a statistically significant influence on teacher attitudes towards inclusion. This suggests that each factor plays a role in shaping inclusionary beliefs and practices, and interventions should consider these intersecting influences.

In Narok West Sub-County, Nyambura and Oigara (2021) investigated the correlation between teaching skills, training methodology, and the academic performance of students with visual impairment. Employing a descriptive research design, the study gathered data through surveys, interviews, observations, and existing records. The results of the study revealed that both teaching skills and training methodology have an impact on the academic performance of students with visual impairment. This implied that the quality of teaching skills and the approach

to training have a significant impact on the academic performance of students with visual impairment in this specific region.

2.3.2 Physical Infrastructure and Access to TEPs among the Visually Impaired

In Malaysia, Amin et al. (2021) conducted a qualitative study to investigate the challenges faced by students with visual impairments, focusing on physical infrastructure in higher education institutions. The research involved in-depth interviews with five students with visual impairments to gather relevant data. These interviews allowed the participants to share their personal experiences and insights regarding their challenges in higher education. The results indicated that physical barriers present significant challenges to access for visually impaired individuals in institutions of higher learning. These barriers can encompass a range of issues related to the physical environment of the campus and its facilities. Lack of ramps or elevators can make it difficult for individuals with mobility impairments, including those with visual impairments, to access buildings with multiple floors. In addition, visually impaired individuals rely on tactile or auditory cues for navigation. Lack of accessible signage can lead to disorientation and difficulty finding classrooms, offices, and facilities.

In India, Kumari and Kaur (2020) conducted an exploratory study to explore the challenges faced by visually impaired students, with a specific focus on physical infrastructure. The research included a population of 53 visually impaired students from schools, colleges, and Panjab University. The sample size was determined using both purposive and snowball sampling techniques. The study revealed that visually impaired students encountered issues related to inadequate infrastructure, such as insufficient ramps, premises, transportation, unfriendly washrooms, difficulties in walking on roads, and challenges in crossing roads, among other concerns. Inadequate ramps and accessibility features make it difficult for visually impaired students to navigate public spaces, buildings, and campuses. In addition, the washrooms were not designed with accessibility in mind can be challenging for visually impaired students.

In Ghana, Ackah and Danso (2019) conducted a descriptive mixed-methods study to investigate the physical environment of inclusive schools in the country. The study involved 164 teachers with diverse teaching experience. It aimed to assess the nature, accessibility, suitability, and

appropriateness of the physical environment in inclusive schools and its impact on Inclusive Education (IE). The findings revealed that a majority of the so-called 'inclusive schools' had a poor-quality physical environment, which could impede their inclusivity for children with disabilities. Moreover, the physical environment was less accessible for children with physical and sensory motor disabilities, potentially posing challenges to the inclusion of children with specific needs. Additionally, the physical environment was deemed less suitable for various physical activities, including sports and physical education.

Wandera et al. (2019) conducted a cross-sectional survey to explore the challenges faced by visually impaired students in accessing education at Makerere and Kyambogo Universities. The study involved visually impaired students, university administrators, and non-visually impaired students as the target population. Data was collected by use of interviews, document review and questionnaires. The results indicated that most of the facilities in the universities including lecture rooms, laboratories and hostels were inaccessible to the visually impaired.

Within the landscape of Kenyan university libraries, Gikunju et al. (2023) investigated the accessibility of library spaces and facilities for individuals with disabilities. The research adopted a pragmatic philosophy and employed a convergent mixed methods design. This approach involved the simultaneous yet separate collection of qualitative and quantitative data. The study encompassed university library users, including students and academic staff, as well as librarians from six public and private universities in Kenya. The findings indicated that lack of ramps and elevators can hinder wheelchair access, making it difficult for individuals with mobility impairments, including those who are visually impaired, to move between different floors of the library. In addition, libraries that lack tactile or auditory signage can pose challenges for visually impaired individuals to navigate the library independently. However, the library should have tactile floor markings to help visually impaired individuals locate important areas, such as entrances, information desks, and restroom facilities.

A study on the effects of physical infrastructure on the transfer of visually impaired students from integrated schools in Narok County, Kenya, was carried out by Koech and Kimani (2022). In order to provide a thorough grasp of the research subject, the study used a mixed-approaches strategy, combining qualitative and quantitative methods. The study involved various groups, including

headteachers, Educational Assessment and Resource Centre (EARC) officers, teachers, and learners with visual impairment in the target population. The findings revealed a deficiency in adequate physical facilities and adaptations in many primary schools, potentially hindering the smooth transition of learners with visual impairment. This observation supports the notion that schools lacking appropriate physical facilities may be ill-prepared to accommodate visually impaired children effectively. Improving the accessibility and adaptability of physical facilities in primary schools is crucial for supporting the successful transition of learners with visual impairment and ensuring inclusive education.

2.3.3 Teaching and Learning Materials Access to TEPs among the Visually Impaired

In the United States, Holt, Gille, and Supalo (2019) undertook a study focused on enhancing the accessibility of physics courses for blind students through the implementation of strategies for course administration, class meetings, and course materials. The study used a systematic review of literature. The study identified limited teaching and learning resources that existed for teaching physics to blind or visually impaired students. The study concentrated on issues within the instructor's responsibility, such as making class meetings, curricular materials, tutorials, and demonstrations accessible. Learning material included a guide to further reading, offering educators a comprehensive reference for additional insights. Also, the inclusion of lessons from the experience of a blind physics major adds a real-world perspective.

Wandera et al. (2019) examined teaching and learning materials as a challenge facing inclusive education among visually impaired students at Makerere and Kyambogo Universities. The study used a cross-sectional survey design and the target population was visually impaired students, university administrators and non-visually impaired students. Data was collected by use of interviews, document review and questionnaires. The results indicated that the methods of instruction and assessment used and the instructional materials provided were a major challenge to the visually impaired students.

Ferreira and Manis (2022) examined the role of teaching and learning materials in addressing equity for learners with visual impairment in schools in South Africa. The study utilised a case study design and collected data from ten special needs schools and seven full-service schools from 5 provinces in South Africa. The findings highlighted the need for teaching and learning materials

in Braille and enlarged font to cater to the unique requirements of visually impaired learners. Moreover, the study highlighted various supportive equipment, including voice recorders, specialized teaching aids, embossers, magnifying glasses, reading monitors, and braillers. These tools enable visually impaired students to access and engage with educational content effectively.

In Zimbabwe, Chimhenga (2019) conducted a study to explore the challenges confronted by students with disabilities in accessing library services within institutions of higher learning. The study was conducted as a case study of Zimbabwe Open University. The study adopted a survey research design and the target population was 25 students with disabilities who had access to the Zimbabwe Open University (ZOU) library as well as 10 ten library staff members. The results indicated that accessing the facilities had various challenges, which included difficulties related to the entrance, restrooms, stairs, elevators, and special rooms. Learning institutions should ensure that the entrance, pathways, and the library's layout are designed to be navigable for individuals with visual impairments.

In a nationwide survey conducted in Zambia, Akakandelwa and Munsanje (2022) investigated the availability of learning and teaching materials for students with visual impairment. Employing a survey research design, the study gathered data through interviews, literature reviews, and assessments. The findings revealed that a majority of schools in Zambia fell short in providing sufficient and suitable learning and teaching materials for pupils with visual impairment. This lack of resources can severely impact the educational experiences of these students. While schools had policies in place for the procurement of learning and teaching materials, the study revealed that budgetary allocations for these activities were often insufficient or non-existent. Inadequate funding can hinder the acquisition of necessary materials.

In Nigeria, Oyebanji and Idiong (2021) studied inadequate teaching and learning materials as a challenge in teaching mathematics to students with visual impairment. The study followed a cross-sectional survey design and questionnaires were used to gather information from the study's participants. The results indicated that insufficient instructional materials create significant barriers to effective learning for visually impaired students. These students often rely on specialized materials and resources to access mathematical concepts and content. In addition, the lack of appropriate instructional materials leads to inequities in education. Visually impaired students may

not have access to the same learning opportunities as their sighted peers. In addition, mathematics teachers struggled to provide effective instruction due to a lack of the necessary materials to support diverse learning needs.

2.3.4 Assistive Technology and Access to TEPs among the Visually Impaired

In India, Kori and Mulla (2021) examined the use of technology in improving the accessibility of library services and facilities for visually impaired students. The study used a descriptive research design and data was collected by use of questionnaires and key informant interviews. The study emphasized the significance of ICT in providing user-friendly and adequate services for visually impaired students. ICT has the potential to bridge the accessibility gap and offer a more inclusive and empowering learning experience. However, the visually impaired population faced challenges in using electronic resources and services in the current digital environment.

In a different study, Mahawariya (2019) examined the use of assistive technology in enhancing inclusive education among visually impaired students in institutions of higher learning. The study used a survey research design. The study was conducted in 11 institutions spread across 7 districts. Out of the 11 institutions, only one, Vivekananda Mission Asram (VMA), was noted for effectively utilizing and providing sufficient access to Braille resources and assistive technology. This indicates the need for other institutes to improve their access to and utilization of such resources to enhance the learning experience for visually challenged students. This underscores the need for increased access, availability, and funding for assistive technology, Braille resources, and trained personnel in these institutes.

Chimhenga (2019) examined the challenges facing students with disabilities in accessing library services in institutions of higher learning in Zimbabwe. The study was conducted as a case study of Zimbabwe Open University. The study adopted a survey research design and the target population was 25 students with disabilities who had access to the Zimbabwe Open University library as well as 10 ten library staff members. The findings revealed deficiencies in the library's resources, including the absence of contemporary equipment such as computers with JOS connected to the Internet, Braille books, books on cassette or CDs designed for students with visual impairment. Additionally, essential tools for individuals with hearing impairment, such as

closed caption decoders, hard-wired systems, personal FM systems, and telecommunication devices, were lacking.

In South Africa, Alabi and Mutula (2020) studied digital inclusion for visually impaired students through assistive technologies in academic libraries. Data sources included websites of companies specializing in Assistive technologies for people with disabilities and the library websites of the top 14 universities globally, based on the 2020 QS world ranking. A review of available information on Assistive technologies integration in academic libraries and the types of technologies used. The findings indicated that academic libraries in the UK and the USA have integrated various ATs into their services for visually impaired students. In addition, Job Access With Speech (JAWS) was identified as the most commonly used screen reader software.

In a systematic review of literature, McNicholl et al. (2021) examined the impact of assistive technology use on students with disabilities in higher education. The researchers conducted a systematic search of five prominent databases: PsycINFO, PubMed, CINAHL, ERIC, and Web of Science (specifically the Social Science Citation Index). Assistive Technologies (AT) can bring about various benefits for students with disabilities (SWDs) in higher education. These benefits extend to educational, psychological, and social aspects, enhancing the overall learning experience and well-being of these students. The limitations and inadequacies of AT devices can pose challenges for SWDs. The suitability and functionality of AT tools play a significant role in determining their usefulness. In addition, the study found that access to external support, such as technical assistance or guidance from specialists, can be crucial for SWDs to maximize the benefits of AT.

In tertiary institutions in Machakos, Kenya, Adongo (2023) examined the role of teaching and learning materials in the inclusion of students with visual impairment. The study employed a case study research design. The study involved a diverse group of participants, including administrators, lecturers, students with visual impairment (VI), students without visual impairment and support staff from the teacher's training college. Data was collected using an open-ended qualitative questionnaire, semi-structured interviews and a focus group interview. The results indicated that students with VI recognized the valuable role of ICT and assistive technology in advancing their education. They expressed that the use of these technologies has made it easier for

them to access information. Assistive technologies, including screen readers, text-to-speech software, and braille displays, play a crucial role in improving the learning experience for students with visual impairment. These technologies offer accessible formats and tools that enable students to navigate digital resources and educational materials effectively.

2.4 Summary of Knowledge Gaps

While various studies have investigated the factors affecting the accessibility of technology education programs for visually impaired individuals in higher education institutions, these studies have been confined to specific countries and institutions. This limitation impedes the broad generalization of their findings. Due to differences in geographical boundaries, institutional practices and regulatory framework, studies conducted in other countries cannot be generalized to the current study.

Studies conducted in Kenya were limited to specific institutions and hence their findings cannot be generalized to the current context. In addition, these studies did not look at the factors influencing inclusive education among the visually impaired in the context of Technology Education Programs for in institutions of higher learning in Kenya. This study sought to fill this gap by examining the effect of the availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology on accessing Technology Education Programs among the visually impaired in institutions of higher learning in Kenya. This is summarized in Table 2.1.

Table 2.1: Summary of the Literature

Study	Focus of the Study	Methodology	Findings	Gap in Knowledge
Ferreira and Manis (2022)	Role of availability of trained staff in addressing equity for learners with visual impairment among schools in South Africa.	The study utilized a case study design.	Teachers were not sufficiently prepared to fulfil this responsibility as they had not received special training on working with visually impaired learners.	The study adopted a case study design and hence focused on one school in South Africa.
Amin et al. (2021)	The study focused on examining the primary challenge faced by students with visual impairment at higher education institutions in Malaysia, namely, the inadequacies in physical infrastructure.	The study employed a qualitative research approach.	Physical barriers present significant challenges to access for visually impaired individuals in institutions of higher learning.	Besides being limited to institutions of higher learning in Malaysia , the study was qualitative and hence did not collect and use quantitative data.
Chimhenga (2019)	The study investigated the difficulties encountered by students with disabilities in accessing library services within institutions of higher learning in Zimbabwe.	The study adopted a survey research design.	The accessibility of the facilities posed numerous challenges, encompassing issues related to entrances, elevators, stairs, restrooms, and specialized rooms.	The focus of this study was on access to library services, while the focus of this study is on access to TEPs in institutions of higher learning.
Mahawariya (2019)	The integration of assistive technology to enhance inclusive education for visually impaired students in higher learning	The study used a survey research design.	There is a need for increased access, availability, and funding for assistive technology, Braille resources.	This study was limited to institutions of higher learning in India. In addition, the study

	institutions in India is a significant focus.			was not specific to access to TEPs.
Zia, Khalid & Malik (2021)	The impediments encountered by students with visual impairments in engaging with online learning at the higher education level in Pakistan	Descriptive research design	Factors affecting students with visual impairments include access to physical infrastructure, access to computers as well as availability of learning material	The study was limited to online learning at higher education level and hence was not specific to technology education programs
Wasike (2019)	The study investigates institutional factors influencing the integration of learners with special needs by university management at the University of Nairobi, Kenya.	The study adopted a cross-sectional research design	Institutional factors influencing university management's integration of learners comprised of availability of physical infrastructure, as well as adequacy of human resources	However, the study was not specific to technology education programs
Firat (2021)	Barriers to inclusive education among students with visual impairments in higher education in Turkey	The study used systematic review of literature	Barriers included lack of learning materials, inaccessibility of lecture notes, inadequate library resources, access to physical infrastructure	The study adopted systematic review of literature and hence no primary data was collected

2.5 Conceptual Framework

Figure 2.1 is a diagrammatic presentation of the relationship between the independent variables and dependent variables (Devi, 2019). The independent variables were the availability of trained staff,

institutional physical infrastructure, availability of teaching and learning materials and assistive technologies. The dependent variable was Access to Technology Education Programs among the visually impaired.

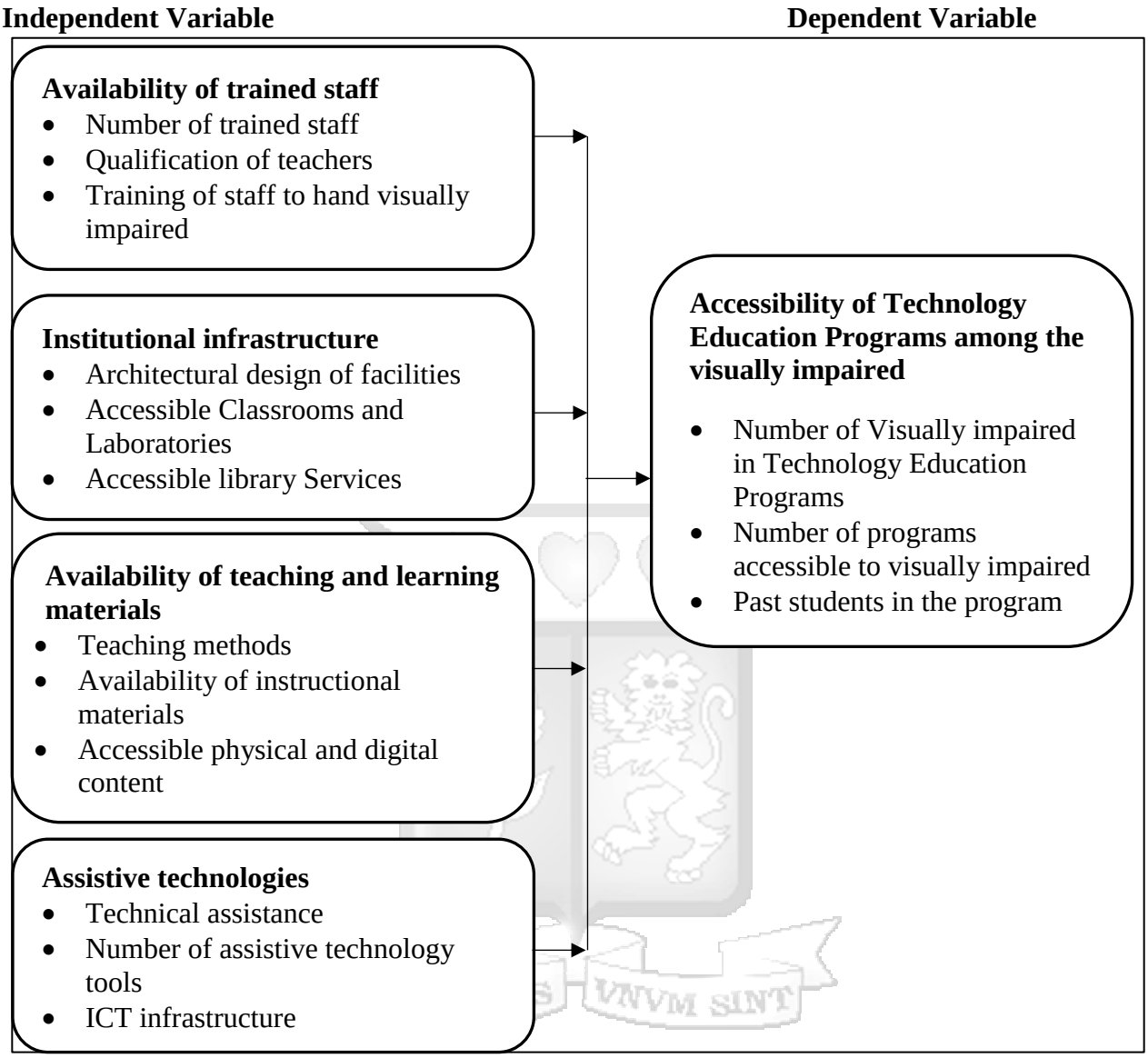

Figure 2.1: Conceptual Framework

Source: Researcher (2024)

The availability of trained staff in higher education institutions for visually impaired students involves ensuring a sufficient number of staff members who are specifically trained and qualified to meet the unique needs of these students (Ferreira & Manis, 2022). This includes having an adequate count of staff with specialized certifications or degrees in special education focused on visual impairment, and ensuring that all educational personnel, including support staff, receive on-going professional development to stay current with best practices and advancements in assistive technology (Josua et

al., 2022). This comprehensive approach ensures that visually impaired students receive the individualized attention and support they need, promoting an inclusive and equitable learning environment that aligns with the principles of Social Justice Theory by providing fair accessible educational opportunities and resources.

In higher education institutions catering to visually impaired students, institutional infrastructure extends beyond mere physical structures to encompass a comprehensive framework facilitating accessibility and inclusivity. Architectural designs prioritize features such as ramps, tactile signage, and navigational aids, ensuring seamless mobility (Amin et al., 2021). Accessible classrooms and laboratories are equipped with adaptable furniture and cutting-edge assistive technologies, fostering a conducive environment for learning. Similarly, libraries offer a range of alternative formats and assistive devices, granting equal access to information resources (Kumari & Kaur, 2020). Through the provision of these essential elements, institutions uphold the tenets of Social Justice Theory by actively levelling the educational playing field, thereby empowering visually impaired students to pursue their academic goals with dignity and equality, irrespective of their abilities.

The availability of teaching and learning materials encompasses a range of considerations crucial for facilitating effective education for visually impaired students. This includes employing diverse teaching methods that cater to different learning styles, utilizing tactile, auditory, and verbal approaches to enhance comprehension and engagement (Holt, Gille & Supalo, 2019). Instructional materials must be accessible, offered in formats such as Braille, large print, and audio recordings, ensuring equitable accessible educational content. Both physical and digital content should be designed with accessibility features, enabling visually impaired students to navigate and interact with materials independently (Wandera et al., 2019). By prioritizing inclusive teaching methods and providing accessible instructional materials in various formats, educators create an environment that promotes equitable accessible education for visually impaired students, aligning with the principles of Social Justice Theory by ensuring that all learners have the opportunity to thrive and succeed academically.

Assistive technologies encompass a range of tools and software designed to support individuals with disabilities, including visually impaired individuals, in performing tasks, accessing information, and enhancing independence (Kori & Mulla, 2021). Technical assistance provides crucial support in helping users effectively utilize these technologies, while the availability of a diverse array of

assistive technology tools ensures that individuals can select options tailored to their specific needs. A robust ICT infrastructure further supports the implementation and use of assistive technologies by providing the necessary hardware, software, and technical support services. Together, these components contribute to creating an inclusive environment that promotes equitable access to resources and opportunities for individuals with disabilities, aligning with the principles of Social Justice Theory by fostering equal participation and inclusion in educational and workplace settings (Mahawariya, 2019). The Technology Acceptance Model (TAM) provides a lens through which to understand the adoption and utilization of assistive technologies by individuals with disabilities, particularly visually impaired individuals. In the context of assistive technologies, visually impaired users evaluate these tools based on their perceived usefulness in supporting tasks, accessing information, and enhancing independence, as well as their perceived ease of use in navigating and interacting with the technology (Chimhenga, 2019). The availability of a diverse array of assistive technology tools allows users to select options that best meet their individual needs, further enhancing perceived usefulness and adoption likelihood.

The accessibility of technology education programs among the visually impaired encompasses ensuring inclusive opportunities and resources for this demographic. Tracking the number of visually impaired individuals enrolled in these programs provides valuable insight into demand and informs decisions regarding infrastructure and support services (Kori & Mulla, 2021). Similarly, assessing the availability of programs designed to accommodate the needs of visually impaired students highlights the progress in creating inclusive educational options within the technology sector (Oyebanji & Idiong, 2021). Examining the experiences of past visually impaired students in these programs offers valuable feedback for enhancing accessibility and tailoring support services. By prioritizing accessibility initiatives and fostering an inclusive learning environment, educational institutions and policymakers uphold principles of social justice, promoting equitable accessible educational opportunities and facilitating the full participation and inclusion of visually impaired learners in the technology field.

2.6 Operationalization of variables

Table 2.2 shows the operationalization of the independent variables and the dependent variable. It covers the study variables, measurement of the variables, scale of measurement of the variables,

supporting literature and supporting theories. The regulatory framework, consisting of laws, policies, and guidelines, shapes the accessibility policies of higher education institutions. It defines the legal requirements and standards for accommodating visually impaired students in technology education programs. The presence or absence of supportive regulations directly influences the institutions' approach to accessibility.

Table 2.2: Operationalization of Variables

Variable	**Measurement**	**Scale of measurement**	**Supporting literature**	**Method of data analysis**
Availability of trained staff	• Number of trained staff • Qualification of teachers • Training of staff to hand visually impaired	• Likert Scale	Ferreira and Manis (2022), Josua et al. (2022), Silas et al. (2022), Nyambura and Oigara (2021)	• Descriptive, Correlation, and regression analysis
Institutional infrastructure	• Architectural design of facilities • Accessible Classrooms and Laboratories • Accessible library Services	• Likert Scale	Amin et al. (2021), Kumari and Kaur (2020), Wandera et al. (2019), Gikunju et al. (2023), Koech and Kimani (2022)	• Descriptive, Correlation, and regression analysis •
Availability of teaching and learning materials	• Teaching methods • Availability of instructional materials • Accessible physical and digital content	• Likert Scale	Wandera et al. (2019), Ferreira and Manis (2022), Chimhenga (2019), Akakandelwa and Munsanje (2022),	• Descriptive, Correlation, and regression analysis •

			Oyebanji and Idiong (2021)	
Assistive technologies	• Technical assistance • Number of assistive technology tools • ICT infrastructure	• Likert Scale	Kori and Mulla (2021), Mahawariya (2019), Chimhenga (2019), McNicholl et al. (2021), Adongo (2023),	• Descriptive, Correlation, and regression analysis •
Accessibility of Technology Education Programs among the visually impaired	• Number of Visually impaired in Technology Education Programs • Number of programs accessible to visually impaired • Past students in the program	• Ratio		• Descriptive, Correlation, and regression analysis •

2.7 Chapter Summary

The literature review explores factors influencing the accessibility of technology education programs among visually impaired individuals, encompassing theoretical perspectives, empirical findings, and research gaps. The theoretical review integrates Social Justice Theory, Social Constructivism, and the Technology Acceptance Model (TAM) to provide a comprehensive understanding of inclusive education. Social Justice Theory emphasizes equity, accessibility, and inclusivity, highlighting the importance of trained staff, accessible physical infrastructure, and assistive technologies in promoting equal opportunities for visually impaired students. TAM focuses on users' perceptions of technology usefulness and ease of use, suggesting that the availability and usability of assistive technologies influence their adoption and utilization. The empirical review delves into the impact of trained staff, physical infrastructure, teaching and learning materials, and assistive technology on accessing technology education programs for the visually impaired. Studies underscore the significance of

professional development for teachers, accessible facilities, inclusive teaching materials, and assistive technologies in facilitating inclusive education. However, gaps in research highlight the need for further investigation into the effectiveness of interventions and the experiences of visually impaired individuals in accessing technology education programs..

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

A research methodology is a systematic and structured approach or framework that researchers use to plan, conduct, and evaluate their research (Krishna, 2020). This chapter outlines the study's research philosophy, target population, sampling frame, sample and sampling technique, data collection instrument, data collection procedures, research quality, data analysis as well as ethical considerations.

3.2 Research Philosophy

Research philosophy refers to the underlying beliefs and assumptions about the nature of reality, knowledge, and the ways in which knowledge is acquired or created within a research study. It serves as the foundation for the research design, guiding the researcher's approach to collecting, interpreting, and understanding data. There are three main research philosophies or paradigms: positivism, interpretivism (or constructivism), and pragmatism (Devi, 2019). Positivism embraces a quantitative and scientific approach to research. It seeks to uncover universal laws and generalizations through systematic observation, experimentation, and statistical analysis. Interpretivism rejects the idea of a single, objective reality. Instead, it acknowledges multiple subjective realities that are socially constructed. Reality is seen as context-dependent and shaped by individuals' perceptions and interpretations. Pragmatism encourages a flexible and mixed-methods approach (Creswell & Creswell, 2022). It suggests that researchers should use whatever methods are most suitable for addressing the research question, regardless of whether they are quantitative or qualitative.

The study adopted a pragmatism research approach. Pragmatism is a philosophical and research approach that emphasizes practical consequences and real-world applications. Pragmatism is anti-absolutist in its ontological stance. Pragmatists reject the idea of fixed, unchanging realities or essences. Instead, they view reality as dynamic, evolving, and context-dependent (Hair, Page & Brunsveld, 2020). One key aspect of the ontological perspective of pragmatism is instrumentalism. Pragmatists emphasize the instrumental or practical nature of reality (Latwal, 2020). Things are considered real and meaningful to the extent that they have practical consequences or utility in human experience. Similar to its ontological perspective, pragmatism adopts an instrumental view of

knowledge. Knowledge is seen as a tool or instrument that humans use to navigate and adapt to their environment. The value of knowledge lies in its practical utility. In the context of research, pragmatism is considered a paradigm that allows researchers to choose methods and theories based on their practical utility for solving real-world problems (Hall, 2020). In pragmatism, the integration of qualitative and quantitative methods is a key feature, reflecting the pragmatic view that the selection of research methods should be driven by their utility in addressing the research problem and achieving practical outcomes (Devi, 2019). In this study, the study sought to determine factors influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya using mixed methods research.

3.2.1 Research Design

The study used both an explanatory research design and mixed methods research design. Explanatory research design is specifically geared toward uncovering causal relationships between variables. It helps researchers go beyond mere correlation and understand the reasons or mechanisms underlying observed phenomena (Hall, 2020). Explanatory research design was used to show the influence of availability of trained staff, institutional physical infrastructure, availability of teaching and learning materials and assistive technologies on access to Technology Education Programs among the visually impaired.

This study utilized a mixed method research design. Mixed methods research is an approach to research that involves integrating both qualitative and quantitative research methods within a single study. Mixed methods research combines the strengths of both quantitative and qualitative approaches, providing a more comprehensive understanding of the research problem. In a large sample size, quantitative methods can identify trends, patterns, and relationships, while qualitative methods can explore the context, reasons, and experiences behind these patterns. Specifically, the study made use of concurrent triangulation design. Concurrent triangulation design is a research design that falls under the broader category of mixed-methods research (Creswell & Creswell, 2022). This design involves collecting and analyzing both qualitative and quantitative data simultaneously, with the aim of corroborating or validating findings from one method with the other. The term "triangulation" refers to the use of multiple data sources or methods to enhance the credibility and comprehensiveness of the research (Devi, 2019). In this study, the study sought to determine factors

influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya using both quantitative and qualitative approaches.

3.3 Population and Sampling

This section covers the study's target population, sampling frame as well as sample size and sampling technique.

3.3.1 Target Population

The target population, in the context of research and sampling, refers to the entire group or set of individuals or elements that are the subject of a study. It represents the larger group from which a researcher selects a sample to draw conclusions and make inferences about the population (Hall, 2020). The target population was 410 visually impaired individuals who are undertaking different courses in the University of Nairobi, 2,786 visually impaired individuals who have completed different courses in the University of Nairobi in the last 5 years, 12 staff in the School of Computing and Informatics, 5 staff working in the Disability Resource Centre at the University of Nairobi as well as heads of the 5 PVIs in Kenya. The University of Nairobi is the largest university in Kenya in terms of number of programs, number of students and availability of facilities. Visually impaired individuals who are undertaking different courses in the University of Nairobi were selected in this study to assess whether they would have wanted to study technology education programmes.

Table 3.1: Target Population

Category	Target population
Visually Impaired students at UON	410
Past Visually Impaired students at UON (5 years)	2,786
Staff in the School of Computing and Informatics	15
Staff working in the Disability Resource Centre	5
Heads of PVIs	5
Total	**3,221**

Source: National Council for Persons with Disabilities (2022)

3.3.2 Sampling Design

Since the population for staff in the School of Computing and Informatics, staff working in the Disability Resource Centre and heads of PVIs is small and census approach was used. The census approach refers to a method of data gathering that involves collecting information from every individual or unit within a defined population or group (Latwal, 2020). In essence, it aims to gather data from the entire population rather than a sample. However, Slovin's Formula was used in the determination of the sample size for the current VI students and past students at University of Nairobi. The research employed 95% level of confidence and a margin error of 0.05.

$$n = \frac{N}{1 + NE^2}$$

Where n = no. of samples; N = total population; E = error margin / margin of error (0.05)

$$n = \frac{3221}{1 + (3221 * 0.05^2)} = 356$$

The study used systematic random sampling in the selection of the study's sample size of 3356 from the target population. Systematic sampling is a probability sampling method used in research and data collection to select a sample from a larger population. It involves selecting every n^{th} individual or element from the population, where "n" is a fixed interval determined by the researcher (Hall, 2020). In this study, every 8^{th} VI from the list of visually impaired current studying at the University of Nairobi and those that finished in the last 5 years was selected.

Table 3.2: Sample Size Distribution

Category	Target population	Sample Size
Visually Impaired students at UON	410	42
Past Visually Impaired students at UON (5 years)	2,786	289
Staff in the School of Computing and Informatics	15	15
Staff working in the Disability Resource Centre	5	5
Heads of PVIs	5	5
Total	**3,221**	**356**

3.4 Data Collection Methods

3.4.1 Data Collection Instruments

The research employed both primary data collection methods, utilizing semi-structured questionnaires and a key informant interview guide. The questionnaire, presented in Appendix II, serves as a research tool designed to systematically gather information from participants. It incorporates a blend of structured (closed-ended) and unstructured (open-ended) questions. Semi-structured questionnaires, as described by Latwal (2020), encompass both fixed-choice questions with predefined response options and open-ended inquiries allowing respondents to provide qualitative insights. This study's questionnaire featured a mix of structured elements, including multiple-choice and Likert scale items (ranging from strongly agree to strongly disagree). Additionally, structured questions captured essential demographic data such as age, gender, education, and occupation through closed-ended inquiries. Open-ended questions encouraged respondents to furnish comprehensive narrative responses in their own words. The questionnaire had six questions. This first section collected data on the demographic information of the participants. The second, third, fourth and fifth sections will cover questions on the independent variables (availability of trained staff, institutional physical infrastructure, availability of teaching and learning materials and assistive technologies). The sixth section collected data on the dependent variable (access to Technology Education Programs among VIs).

The key informant interview, presented in Appendix III, represents a qualitative research approach characterized by in-depth, one-on-one interviews with individuals possessing specialized knowledge or expertise in a specific subject or area of interest to the research, as outlined by Kumar (2019). The key informants in this study was staff in the School of Computing and Informatics and the Disability Resource Centre at the University of Nairobi as well as the heads of the 5 PVI associations in Kenya. Qualitative data was gathered using a key informant interview guide, designed to explore aspects related to both independent and dependent variables. The interview guide encompassed a series of questions addressing the key factors under investigation.

3.4.2 Data Collection Procedures

Data collection procedures refer to the specific methods, techniques, and steps used to gather data for a research study (Sileyew, 2019). These procedures are an essential aspect of the research process and are designed to ensure the collection of accurate and reliable data. The data collection process started with obtaining consent from the Strathmore Business School ethics committee followed by the application for a research permit from National Commission for Science, Technology and Innovation (NACOSTI). The list of visually impaired individuals who are undertaking different courses in the University of Nairobi as well as visually impaired individuals who have completed different courses in the University of Nairobi in the last 5 years was obtained. The study used soft copies of the questionnaires and Google forms to collect data from visually impaired. In addition, using email addresses obtained from PVIs, the questionnaire was distributed to the visually impaired. Daily follow-ups were conducted to closely track the progress of respondents as they complete the questionnaires. Additionally, appointments were scheduled with key informants for in-depth interviews. The entire data collection process is anticipated to span approximately one month, ensuring a comprehensive and thorough exploration of the subject matter.

3.5 Research Quality

Research quality refers to the overall excellence and reliability of a research study in terms of its design, execution, analysis, and reporting. The quality of research is essential for ensuring that the findings are credible, valid, and contribute meaningfully to the existing body of knowledge (Latwal, 2020).

3.5.1 Pilot Testing

A pilot test serves as a preliminary, small-scale study aimed at assessing the feasibility, duration, cost, and potential adverse events, with the goal of refining the study design before embarking on a full-scale research project (Waddell, 2020). To ensure the clarity and effectiveness of the upcoming research, a pre-test was conducted to identify and rephrase any ambiguous, misinterpreted, or misunderstood questions. This pre-test phase also addressed typographical errors and assess the relevance and appropriateness of the questions posed.

The pre-testing of research instruments was carried out in both the School of Computing and Informatics and the Kenyatta University Directorate of Disability Services (DODS). The pre-test group, constituting 10% of the intended sample size, was randomly selected. This approach aligns with Kumar's recommendation (2019) to utilize 10% of the sample required for the full study in the pre-testing phase. This meticulous pre-test process aims to enhance the quality and reliability of the research instruments and ensure a robust foundation for the subsequent comprehensive study.

3.5.2 Validity of Research Instruments

The validity of a research instrument is a crucial aspect of research that assesses the extent to which the instrument accurately and effectively measures what it is intended to measure (Mukherjee, 2020). The study focused on two types of validity, content validity and face validity. Face validity is a type of content validity that refers to the extent to which an assessment or measurement instrument appears, on the surface, to be a valid and appropriate tool for measuring a specific construct or concept (Sileyew, 2019). Face validity involves a subjective and qualitative judgment rendered by experts or individuals who may not necessarily be experts in the specific field, primarily based on the instrument's apparent suitability or external appearance. In the context of this study, efforts were made to augment face validity by soliciting reviews from experts in the field of business management, including the supervisor. On the other hand, content validity scrutinizes whether the instrument effectively encompasses all pertinent aspects of the concept or construct under consideration (Latwal, 2020). It seeks to determine whether the questions, items, or tasks included are not only appropriate but also representative of the targeted construct. To bolster content validity, the arrangement of questions in the questionnaire was aligned with the indicators and objectives established for the study. This meticulous approach ensures a thorough examination of the instrument's content, contributing to its overall validity and reliability in measuring the intended variables.

3.5.3 Reliability of Research Instruments

Reliability stands as a crucial concept in the realm of research and measurement, gauging the consistency, stability, and dependability of a given measurement instrument or assessment tool. In this study, reliability was assessed through the lens of internal consistency, as outlined by Bhattacherjee (2018). The prevalent method for gauging internal consistency, Cronbach's alpha, will be employed. Cronbach's alpha values, ranging from 0 to 1, serve as indicators of reliability in this

approach. An alpha coefficient falling between 0.7 and 0.8 is deemed acceptable, while a value of 0.8 or higher is considered indicative of good reliability (Stokes & Wall, 2017). For this study, a Cronbach's alpha of 0.7 was deemed acceptable, signifying an adequate level of reliability. Conversely, if the coefficient falls below 0.7, a revision of the statements under a construct was undertaken until a Cronbach's alpha exceeding 0.7 is achieved. This meticulous approach ensures the reliability of the measurement instrument employed in capturing the study's variables.

Table 3. 3: Reliability Results

Variables	Cronbach's alpha
Availability of trained staff	0.789
Institutional infrastructure	0.821
Availability of teaching and learning materials	0.844
Assistive technologies	0.744
Accessibility of Technology Education Programs among the visually impaired	0.831
Average	**0.806**

From the results, the availability of trained staff had a Cronbach's alpha of 0.789, Institutional infrastructure had a Cronbach's alpha of 0.821 and Availability of teaching and learning materials had a Cronbach's alpha of 0.844. In addition, Assistive technologies had a Cronbach's alpha of 0.744 and Accessibility of Technology Education Programs among the visually impaired had a Cronbach's alpha of 0.831. The average Cronbach's alpha of 0.806 suggests that the measurement tool used in the study is generally reliable, with all values above 0.7 indicating good to excellent consistency.

3.6 Data Analysis

The research instruments employed in this study are designed to yield a combination of qualitative and quantitative data. For the qualitative component, the analysis utilized thematic analysis, a widely acknowledged method for interpreting qualitative data gathered from open-ended questions and key informant interviews. Thematic analysis involves a systematic process of identifying, analyzing, and elucidating patterns or themes within qualitative data, thereby facilitating a more profound comprehension of the research topic (Mukherjee, 2020). This method offers both

structure and flexibility, providing a systematic approach to making sense of the intricate and abundant qualitative data obtained in the study.

Quantitative data obtained from the questionnaires underwent a systematic process, including editing, coding, and entry into the Statistical Package for Social Sciences (SPSS version 22), a specialized statistical software. The analysis of quantitative data encompassed both descriptive and inferential statistics. Descriptive statistics, such as frequency distribution, percentages, and measures of central tendencies (mean), along with measures of dispersion (standard deviation), will provide an initial overview. Subsequently, inferential statistics, including Pearson correlation analysis and regression analysis, were employed to delve deeper into relationships and associations within the data. The study upheld a 95% confidence level, setting the significance threshold at a p-value of 0.05. Consequently, associations and relationships with a p-value of 0.05 or below were deemed statistically significant, while those exceeding 0.05 will be considered statistically insignificant. The findings were presented through various mediums, including tables and visual aids such as bar charts and pie charts, to enhance clarity and comprehension.

Since independent variables in this research are four, the multivariate regression model was as follows;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Whereby:

Y = Access to Technology Education Programs among the visually impaired;

β_0 = Constant;

$\beta_1, \beta_2, \beta_3, \beta_4$ = Coefficients of determination;

X_1 = Availability of trained staff;

X_2 = Institutional physical infrastructure;

X_3 = Availability of teaching and learning materials;

X_4 = Assistive technologies; and

ε = Error term

3.7 Ethical Considerations

Ethics refers to the legal or acceptable code of conduct that the researcher will consider when conducting this study (Hair et al., 2020). A data collection permit from National Commission for Science, Technology and Innovation (NACOSTI) was requested alongside consent from the Strathmore Business School ethics committee. Furthermore, the study uphdld principles essential to an acceptable code of conduct in any business endeavor, including the respect for human dignity, beneficence, and justice. Throughout the research, the ethical principle of informed consent was rigorously adhered to, as articulated by Fraenkel (2014). This involves ensuring that participants comprehend the nature of the research and voluntarily agree to partake in the study. To uphold the principle of sensitivity, potential respondents were approached to ascertain their willingness to participate before being provided with the questionnaires.

In the interest of maintaining confidentiality, participants received assurance that any information they provide during the study was treated with the utmost confidentiality and used exclusively for educational purposes. Data documents were securely stored in a restricted location, accessible only to designated individuals. To safeguard anonymity, the research instrument refrained from collecting identifying information unless essential for the study protocol. Participants were explicitly instructed not to disclose personal contacts or names when completing the questionnaires for this study.

3.8 Chapter Summary

This chapter has presented the procedures and methods that were used in conducting the study. The study adopted a pragmatism research approach. In addition, the study used both an explanatory research design and mixed methods research design. Specifically, the study made use of concurrent triangulation design.. This study will employ a combination of primary data collection methods, utilizing semi-structured questionnaires and a key informant interview guide. The research instruments have been designed to yield both qualitative and quantitative data. Qualitative data, obtained from open-ended questions and key informant interviews, underwent thematic analysis for a comprehensive understanding. Quantitative data, gathered through the questionnaires, underwent a systematic process involving editing, coding, and entry into statistical software, specifically the Statistical Package for Social Sciences (SPSS version 22). The analysis of quantitative data encompassed both descriptive and inferential statistics. Descriptive statistics,

including frequency distribution, percentages, and measures of central tendencies (mean), along with measures of dispersion (standard deviation), provided an initial overview. Subsequently, inferential statistics such as Pearson correlation analysis and regression analysis were employed to explore deeper relationships within the data. This methodical approach ensures a comprehensive examination of both qualitative and quantitative aspects of the study.

CHAPTER FOUR
DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter comprises data analysis, interpretation of results and presentation of the study findings in relation to the general and the specific study objectives. The purpose of the study was to examine factors influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The chapter begins with a response rate, followed by demographic data, descriptive analysis of the independent variables and inferential statistics, which included correlation analysis and regression analysis.

4.2 Questionnaires' Response Rate

The sample size of the study was 42 visually impaired individuals who are undertaking different courses in the University of Nairobi, 289 visually impaired individuals who have completed different courses in the University of Nairobi in the last 5 years, 15 staff in the School of Computing and Informatics, 5 staff working in the Disability Resource Centre at the University of Nairobi as well as heads of the 5 PVIs in Kenya. The response rate was as shown in Table 4.1.

Table 4.1: Questionnaires' Response Rate

Category	Sample Size	Responses	Response Rate
Visually Impaired students at UON	42	41	97.62
Past Visually Impaired students at UON (5 years)	289	250	86.51
Staff in the School of Computing and Informatics	15	13	86.67
Staff working in the Disability Resource Centre	5	4	80.00
Heads of PVIs	5	4	80.00

Total	**356**	**312**	**87.64**

Out of a sample size of 356, 312 responses were obtained, which gives an 87.64% response rate. According to Latwal (2020), a response rate of 50% is sufficient for effective analysis and reporting, a response rate of 60% is good while a response rate of 70% is regarded as excellent. This implies that the response rate (87.64%) in this study was within acceptable limits for drawing conclusions and making recommendations.

4.4 General Information

General information in this study covered the respondents' gender, age bracket, whether a current student or not, education level and course undertaken.

4.4.1 Gender of the Respondents

The respondents, who included current and past visually impaired students at the University of Nairobi, were requested to indicate their gender. Figure 4.2 shows the distribution of gender among respondents to a study. From the results, 52.9% of respondents identified were female while 47.1% were identified as male. The findings suggest a slightly higher percentage of female respondents compared to male respondents in the sample population. The findings imply that the sample population of the study has a relatively balanced gender distribution with a slight majority of female respondents.

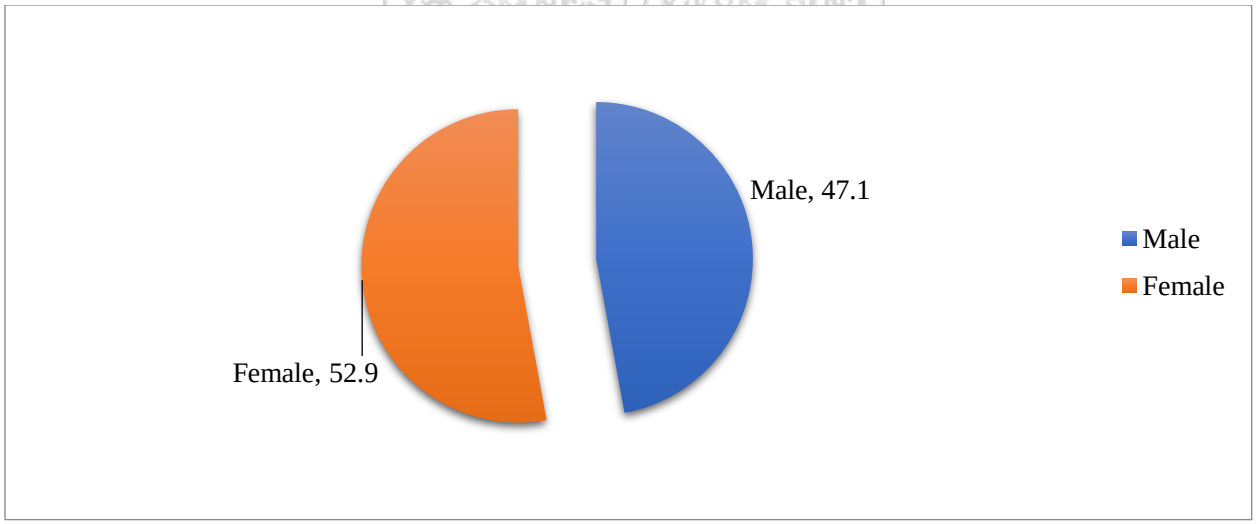

Figure 4.1: Gender of the Respondents

4.4.2 Age Bracket of the Respondents

The respondents, who included current and past visually impaired students at the University of Nairobi, were asked to indicate their age bracket. Figure 4.2 illustrates the distribution of respondents across different age brackets in the study. From the results, 37.8% of respondents fell into the age bracket of 18 to 24 years old, 34.0% were aged between 25 and 34 years, 16.5% were aged between 35 and 44 years, 9.3% were aged between 45 and 54 years and 2.4% were aged between 55 and 64 years. The results suggest that the majority of respondents are younger, with the highest percentage falling into the 18-24 and 25-34 age brackets, while fewer respondents are in older age brackets such as 55-64 years. This age distribution indicates that the perspectives and experiences captured in the study are likely more reflective of younger populations, which could influence the study's outcomes and relevance to different age groups.

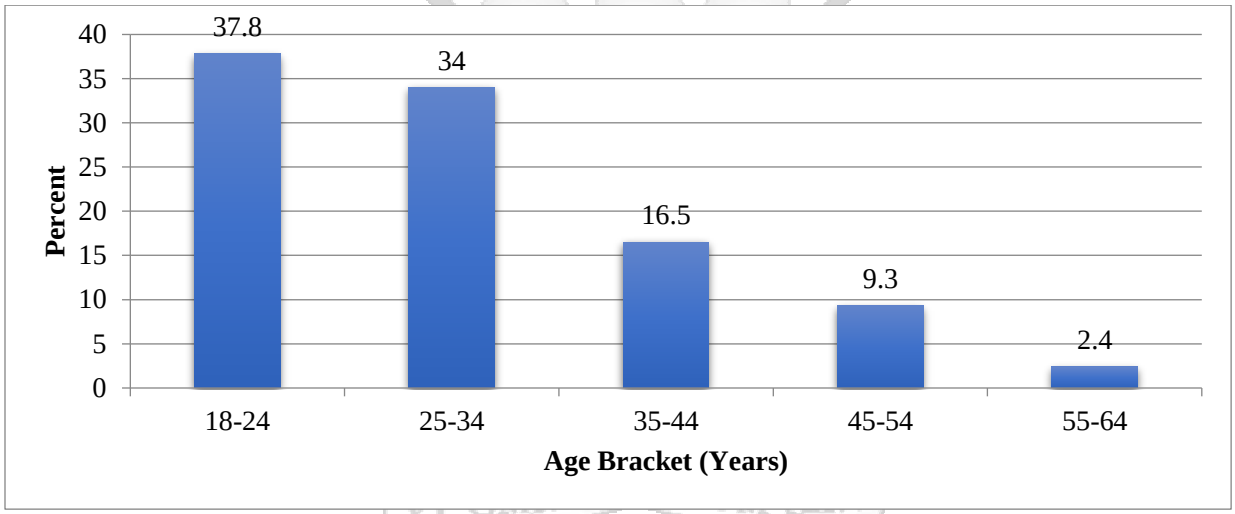

Figure 4.2: Age Bracket of the Respondents

4.4.3 Currently a Student or Past Student

The participants, who included current and past visually impaired students at the University of Nairobi, were asked to indicate their student status. Figure 4.3 depicts the distribution of respondents' student status in the study. From the results, 85.9% of respondents were students who have graduated within the last 5 years while 14.1% of respondents indicated that they were currently enrolled as students. This shows that the majority of respondents were students who had graduated within the last 5 years, while a smaller proportion are currently enrolled as students.

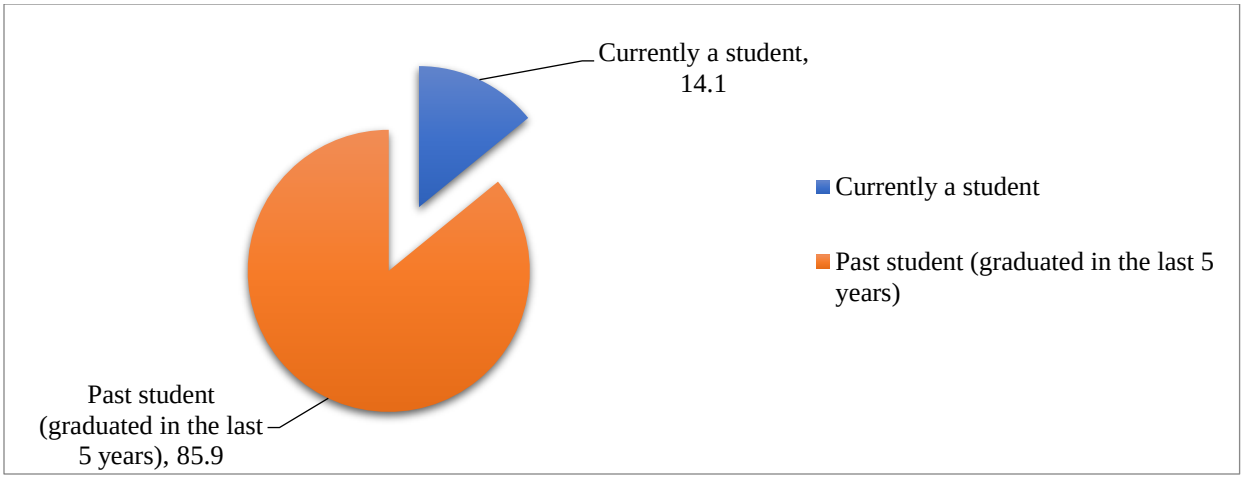

Figure 4.3: Currently a Student or Past Student

4.4.4 Level of Education of the Respondents

The participants, who included current and past visually impaired students at the University of Nairobi, were requested to indicate their highest level of education. Figure 4.4 illustrates the distribution of respondents based on their highest education level in the study. From the results, 47.4% of respondents had attained or were attaining a bachelor's degree or completed undergraduate studies as their highest education level. In addition, 34.4% of respondents had pursued education beyond the undergraduate level, such as completing a master's degree or doctoral studies. Also, 18.2% of respondents held a certificate or diploma as their highest education level. The findings suggest that a significant portion of respondents had completed or were pursuing bachelor's degrees or undergraduate studies, followed by postgraduate education, while a smaller proportion have certificates or diplomas as their highest educational attainment.

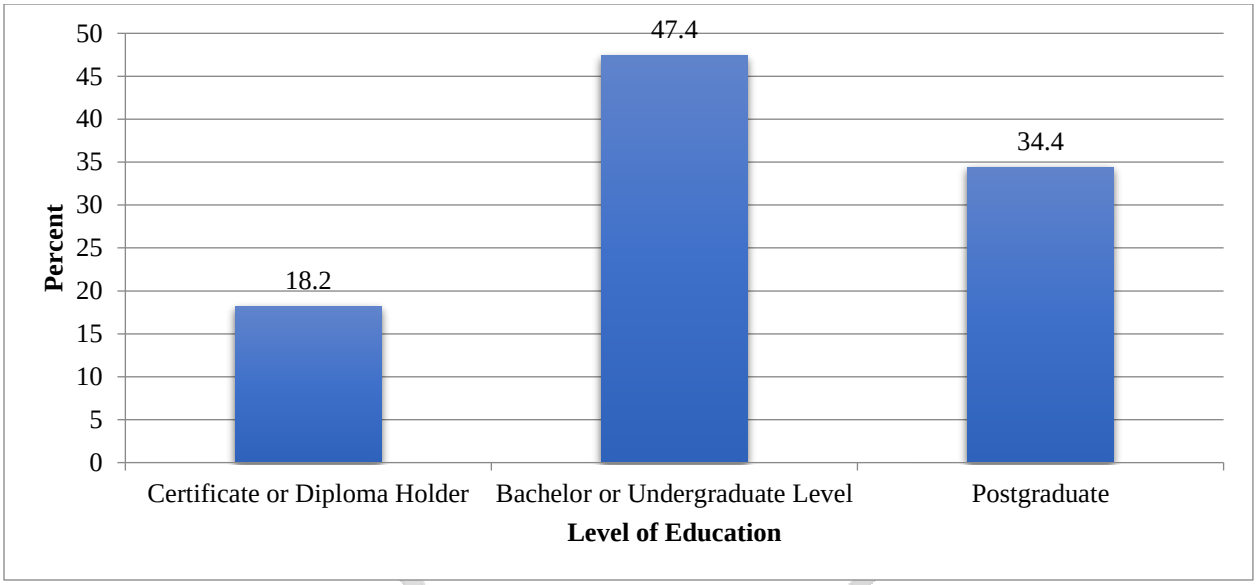

Figure 4.4: Level of Education of the Respondents

4.4.5 Course Undertaken by the Respondents

The participants, who included current and past visually impaired students at the University of Nairobi, were asked to indicate the course they were undertaking or had undertaken. Figure 4.5 shows the distribution of respondents based on the courses they have taken or are currently taking in a survey or study. From the results, 80.8% of respondents had taken or were currently taking courses that are not related to technology. In addition, 19.2% of respondents had taken or were currently taking courses related to technology. The findings suggest that the majority of respondents have taken or are enrolled in non-technology programs, while a smaller proportion have chosen technology-related courses.

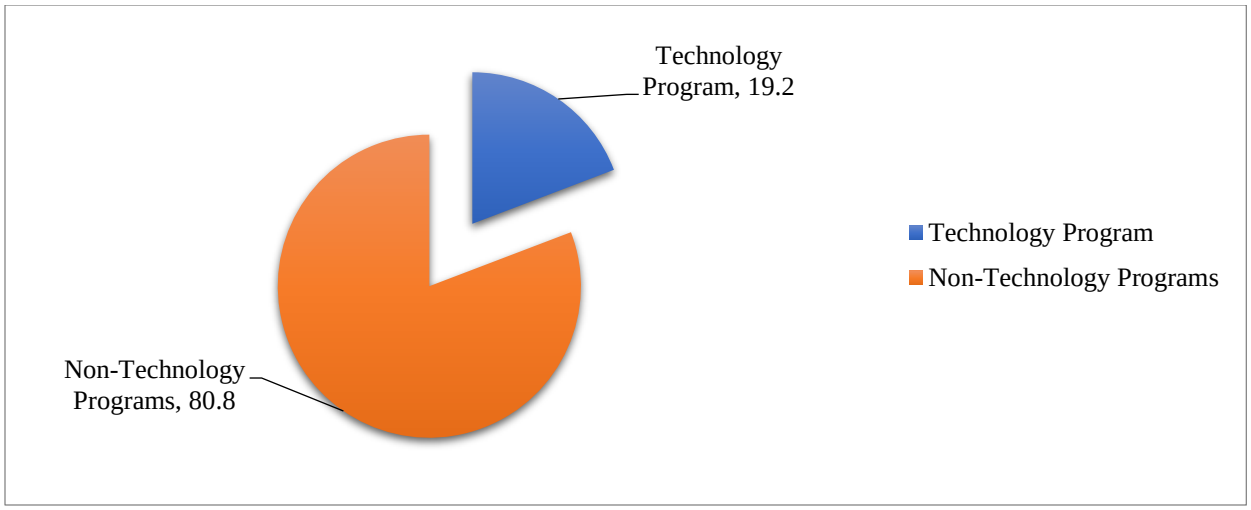

Figure 4.5: Course Undertaken by the Respondents

4.5 The Influence of Availability of Trained Staff on the Access to TEP

4.5.1 Descriptive Statistics on Availability of Trained Staff

The respondents, who included visually impaired current and past students at the University of Nairobi, were asked to indicate their level of agreement with various statements on the availability of trained staff. With a mean of 4.038 (Std. Deviation = 0.856), the respondents agreed that insufficient numbers of trained staff pose a significant barrier to the success of visually impaired students. Conversely, with a mean of 2.402 (Std. Deviation = 1.141), the respondents disagreed with the statement indicating that there is an adequate number of trained staff members to support visually impaired students in the institution. Similarly, with a mean of 2.282 (Std. Deviation = 1.190), the respondents disagreed with the statement indicating that the ratio of trained staff to visually impaired students is appropriate to ensure effective support.

The respondents agreed, with a mean of 3.935 (Std. Deviation = 1.116), that staff members are comfortable interacting with visually impaired students and providing them with assistance. Regarding the knowledge of teachers in technology education programs about the specific needs of visually impaired students, the respondents disagreed, with a mean of 2.069 (Std. Deviation = 1.090). With a mean of 2.237 (Std. Deviation = 1.235), the respondents disagreed with the statement indicating that teachers in technology education programs are able to effectively adapt teaching methods and materials to meet the needs of visually impaired students.

Regarding the effectiveness of the training provided to staff members in enhancing their ability to support visually impaired students, the respondents were neutral, with a mean of 3.082 (Std. Deviation = 1.431). However, with a mean of 1.955 (Std. Deviation = 1.000), the respondents disagreed that staff members in the institution are adequately trained to assist visually impaired students. Likewise, with a mean of 1.921 (Std. Deviation = 1.103), the respondents disagreed that staff members are trained in Braille and other assistive technologies relevant to the needs of visually impaired students.

Table 4.2: Availability of Trained Staff

Statements	Mean	Std. Deviation
There are an adequate number of trained staff members to support visually impaired students in my institution.	2.402	1.141
The ratio of trained staff to visually impaired students is appropriate to ensure effective support.	2.282	1.190
Insufficient numbers of trained staff pose a significant barrier to the success of visually impaired students.	4.038	.856
Teachers in technology education programs are knowledgeable about the specific needs of visually impaired students.	2.069	1.090
Staff members are comfortable interacting with visually impaired students and providing them with assistance.	3.935	1.116
Teachers in technology education programs are able to effectively adapt teaching methods and materials to meet the needs of visually impaired students.	2.237	1.235
Staff members in my institution are adequately trained to assist visually impaired students.	1.955	1.000
Staff members are trained in Braille and other assistive technologies that are relevant to the needs of visually impaired students.	1.921	1.103

The training provided to staff members is effective in enhancing their ability to support visually impaired students.	3.082	1.431

4.5.2 Inferential Statistics for Availability of Trained Staff and Access to TEP

Pearson correlation analysis was used to assess the relationship between the availability of trained staff and access to TEP. The results of the correlation analysis are presented in Table 4.3.

Table 4.3: Correlation Coefficients for Availability of Trained Staff and Access to TEP

		Accessibility of Technology Education Programs among the visually impaired	**Availability of Trained Staff**
Accessibility of Technology Education Programs among the visually impaired	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	291	
Availability of Trained Staff	Pearson Correlation	.832**	1
	Sig. (2-tailed)	.000	
	N	291	291

The results show a very strong positive correlation between the availability of trained staff and the accessibility of technology education programs among visually impaired individuals (r=0.832, p-value=0.000). It implies that as the availability of trained staff increases, the accessibility of technology education programs for visually impaired students also tends to increase.

Linear regression analysis was used to assess the weight of the influence of the availability of trained staff on access to technology education programs among the visually impaired. The r squared (R^2) represents the proportion of variance in the outcome variable (accessibility of technology education programs) that can be explained by the predictors included in the model. In this case, as shown in Table 4.4, the R^2 was 0.237, indicating that approximately 23.7% of the variance in the accessibility

of technology education programs among the visually impaired can be accounted for by the availability of trained staff.

Table 4. 4: Model Summary for Availability of Trained Staff and Access to TEP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.487[a]	0.237	0.219	0.6726

a. Predictors: (Constant), Availability of Trained Staff

The Analysis of Variation (ANOVA) results provide information about the overall fit of the regression model and the significance of the predictor in explaining the variance in the dependent variable (Accessibility of Technology Education Programs among the visually impaired). As shown in Table 4.5, the F-statistic is 184.488 was greater than the F-critical of 2.372 from the F-distribution table. In addition, a significance level (Sig.) less than a chosen alpha level (commonly 0.05) indicates that the regression model is statistically significant. Therefore, a Significance Level of 0.000 indicates that the regression model is highly significant. The results show that the regression model, which includes the availability of trained staff is highly significant in explaining the variance in the accessibility of technology education programs among the visually impaired.

Table 4.5: ANOVA for Availability of Trained Staff and Access to TEP

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	28.168	1	28.168	184.488	.000[b]
	Residual	44.125	289	0.153		
	Total	72.293	290			

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

b. Predictors: (Constant), Availability of Trained Staff

Regression equation was;

$Y = 1.205 + 0.509X_1 + \varepsilon$

The findings show that availability of trained staff has a positive and significant effect on the access to technology education programs among the visually impaired in institutions of higher learning in Kenya (β_1=0.509, p-value=0.000). This means that for every one-unit increase in the availability of trained staff, the Accessibility of Technology Education Programs among the visually impaired is predicted to increase by 0.509 units. The associated p-value (Sig.) is 0.000, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that the availability of trained staff significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Table 4.6 Regression Coefficients for Availability of Trained Staff and Access to TEP

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.205	0.251		4.799	0.000
	Availability of Trained Staff	0.509	0.137	0.489	3.715	0.000

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

4.5.3 Qualitative for Availability of Trained Staff and Access to TEP

The current and past visually impaired students at the University of Nairobi were requested to indicate how availability of trained staff influences the access to Technology Education Programs among the visually impaired in institutions of higher learning in Kenya. From the findings, the respondents indicated that the availability of trained staff in institutions of higher learning in Kenya is paramount for facilitating access to technology education programs. These professionals serve as lifelines, offering tailored support and guidance essential for inclusion in academic pursuits, as one visually impaired student aptly expressed,

> "Trained staff are like beacons guiding us through the complexities of technology education. Their expertise ensures that we receive personalized accommodations and assistance, enabling us to overcome barriers and actively engage with the curriculum." R05

Without their specialized knowledge and assistance, navigating the intricacies of technology-based

coursework would be daunting and sometimes insurmountable. Moreover, trained staff members play a pivotal role in fostering an inclusive learning environment that empowers visually impaired students to thrive. Through their advocacy efforts and commitment to accessibility, they champion rights to equal educational opportunities, as another visually impaired student emphasized,

> "Having trained staff who understand our needs ensures that technology education programs become more than just accessible—they become welcoming spaces where we can fully participate and excel." R11

The respondents also indicated that trained staff dedication goes beyond mere accommodation; it encompasses a genuine commitment to the success and empowerment of the visually impaired. With their support, visually impaired students can confidently pursue their academic aspirations and contribute meaningfully to the technological landscape of Kenya and beyond.

The key informants were also asked to indicate how training of staff in the School of Computing and Informatics contributes to the accessibility of technology education for visually impaired students. They indicated that training equips staff members with the knowledge and skills necessary to implement best practices for designing accessible learning materials and environments. This includes creating accessible digital content, utilizing assistive technologies, and adopting alternative teaching methods. As stated by a Disability Resource Centre staff member,

> "Through training sessions and workshops, staff members learn about best practices for designing accessible digital content." KII01

The key informants also indicated that training fosters a proactive approach to inclusion, empowering staff members to actively promote accessibility within technology education. By providing staff with the tools and strategies to address the unique challenges faced by visually impaired students, the training contributes to a more inclusive learning environment. However, the key informants also highlighted that they had the last training more than 2 years ago and hence suggested that the institution should increase the frequency of training.

> "The last training session we attended was over two years ago. Consequently, we strongly recommend that the institution increases the frequency of training sessions." KII05

The key informants were asked to indicate how staff members prepared to support the unique needs of visually impaired students in technology education. From the findings they indicated that some of the staff members had undergone training programs that cover a range of topics relevant to supporting visually impaired students in technology education. These programs include workshops, seminars, and hands-on training sessions covering areas such as disability awareness, accessible design principles, and the use of assistive technologies. Other key informants indicated that in their experience, most of the staff members were not adequately prepared to support unique needs of the visually impaired.

> "I'm sorry, but in my experience, staff members have not been adequately prepared to support the unique needs of visually impaired students in technology education." KII06

The key informants were asked to share any initiatives or programs aimed at enhancing the skills of staff members in addressing the needs of visually impaired students in technology education. From the results, the key informants indicated that various initiatives and programs, including faculty development workshops and collaborations with disability support services, aim to enhance staff members' skills in addressing the needs of visually impaired students. These programs emphasize creating an inclusive learning environment. However, the key informants also emphasized that the initiatives and programs were still inadequate.

4.6 The influence of Institutional infrastructure on the access to TEP

4.6.1 Descriptive Statistics on Institutional infrastructure

Visually impaired current and past students at the University of Nairobi were asked to indicate their level of agreement with various statements on institutional infrastructure. With a mean of 3.962 (Std. Deviation = 1.021), the respondents agreed that the architectural design of their institution's facilities is accessible to visually impaired students. Similarly, with a mean of 3.320 (Std. Deviation = 1.356), the respondents were neutral with the statement indicating that buildings and pathways are generally free of obstacles and hazards that could pose a danger to visually impaired students. However, with a mean of 2.048 (Std. Deviation = 1.055), the respondents disagreed regarding the provision of tactile surface. Similarly, with a mean of 1.990 (Std. Deviation = 1.011), the respondents disagreed with the

statement indicating that restrooms and other common areas are designed to accommodate the needs of visually impaired students. Regarding the accessibility of doors and entrances, the respondents disagreed, with a mean of 2.948 (Std. Deviation = 1.402), that they are designed to be easily accessible to visually impaired students.

With a mean of 2.103 (Std. Deviation = 1.096), the respondents disagreed with the statement indicating that furniture and equipment are arranged in a way that allows for easy movement and access by visually impaired students. Regarding lighting, the respondents disagreed, with a mean of 2.027 (Std. Deviation = 1.016), suggesting that lighting may not consistently accommodate the needs of visually impaired students. In addition, with a mean of 1.845 (Std. Deviation = 0.792), the respondents disagreed that classrooms and laboratories in their institution are designed to be accessible to visually impaired students.

Concerning library services, the respondents disagreed, with a mean of 2.110 (Std. Deviation = 1.077), indicating that library services may not be consistently accessible to visually impaired students. With a mean of 2.072 (Std. Deviation = 1.052), the respondents disagreed regarding whether library staff are adequately trained to assist visually impaired students with their needs. Similarly, with a mean of 1.979 (Std. Deviation = 1.013), the respondents disagreed regarding the availability of library materials in accessible formats, such as Braille, audio, and large print.

Table 4.7: Institutional Infrastructure

Statements	Mean	Std. Deviation
The architectural design of my institution's facilities is accessible to visually impaired students.	3.962	1.021
Buildings and pathways are free of obstacles and hazards that could pose a danger to visually impaired students.	3.320	1.356
Tactile surfaces and signage are provided to assist visually impaired students in navigating the premises.	2.048	1.055

Doors and entrances are designed to be easily accessible to visually impaired students.	2.948	1.402
Restrooms and other common areas are designed to accommodate the needs of visually impaired students.	1.990	1.011
Classrooms and laboratories in my institution are designed to be accessible to visually impaired students.	1.845	.792
Furniture and equipment are arranged in a way that allows for easy movement and access by visually impaired students.	2.103	1.096
Lighting is adequate and glare-free to accommodate the needs of visually impaired students.	2.027	1.016
Library services in my institution are accessible to visually impaired students.	2.110	1.077
Library materials are available in accessible formats, such as Braille, audio, and large print.	1.979	1.013
Library staff is trained to assist visually impaired students with their needs.	2.072	1.052

4.6.2 Inferential Statistics for Institutional infrastructure and Access to TEP

Pearson correlation analysis was used to assess the relationship between institutional infrastructure and access to TEP. The results of correlation analysis were as presented in Table 4.8.

Table 4.8: Correlation Coefficients for Institutional infrastructure and Access to TEP

		Accessibility of Technology Education Programs among the visually impaired	**Institutional infrastructure**
Accessibility of Technology Education Programs among the visually impaired	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	291	

Institutional infrastructure	Pearson Correlation	.727**	1
	Sig. (2-tailed)	.000	
	N	291	291

The results indicate a strong positive correlation between institutional infrastructure and the accessibility of technology education programs among visually impaired individuals (r=0.727, p-value=0.000). It implies that institutions with better infrastructure tend to have more accessible technology education programs for visually impaired students.

Linear regression analysis was used to assess the weight of the influence of institutional infrastructure on access to technology education programs among the visually impaired. In this case, as shown in Table 4.9, the R^2 was 0.261, indicating that approximately 26.1% of the variance in the accessibility of technology education programs among the visually impaired can be accounted for by institutional infrastructure.

Table 4. 9: Model Summary for Institutional infrastructure and Access to TEP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.511[a]	0.261	0.278	0.2332

a. Predictors: (Constant), Institutional infrastructure

As shown in Table 4.10, the F-statistic is 155.313 was greater than f-critical of 2.372 from F-distribution table. In addition, a significance level (Sig.) less than a chosen alpha level (commonly 0.05) indicates that the regression model is statistically significant. Therefore, a Significance Level of 0.000 indicates that the regression model is highly significant. The results show that the regression model, which includes the institutional infrastructure is highly significant in explaining the variance in the accessibility of technology education programs among the visually impaired.

Table 4.10: ANOVA for Institutional infrastructure and Access to TEP

Model	Sum of Squares	df	Mean Square	F	Sig.

1	Regression	23.234	1	23.234	155.313	.000[b]
	Residual	43.233	289	0.150		
	Total	66.467	290			

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

b. Predictors: (Constant), Institutional infrastructure

Regression equation was;

$Y = 1.205 + 0.368X_2 + \varepsilon$

The results show that physical infrastructure has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_2=0.368, p-value=0.001). This means that for every one-unit increase in institutional infrastructure, the Accessibility of technology education programs among the visually impaired is predicted to increase by 0.368 units. The associated p-value (Sig.) is 0.001, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that institutional infrastructure significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Table 4.11 Regression Coefficients for Institutional infrastructure and Access to TEP

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.205	0.251		4.799	0.000
	Institutional infrastructure	0.368	0.129	0.356	2.853	0.001

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

4.6.3 Qualitative for Institutional Infrastructure and Access to TEP

The current and past visually impaired students at the University of Nairobi were requested to indicate how physical infrastructure influences the accessibility of technology education programs among the

visually impaired in institutions of higher learning in Kenya. They indicated that the physical infrastructure of institutions of higher learning in Kenya significantly influences the accessibility of Technology Education Programs. The design and layout of buildings, pathways, classrooms, and laboratories directly impact our ability to navigate and engage with educational resources. As one visually impaired student aptly stated,

> "Physical infrastructure is more than just architecture; it's the foundation of our educational experience. When buildings are inaccessible or poorly designed, it creates barriers that hinder our participation in technology education programs." R013

Uneven pathways, lack of tactile signage, and poorly equipped classrooms isolate visually impaired students and impede their access to essential learning materials and equipment. In addition, accessible physical infrastructure is essential for fostering an inclusive learning environment where visually impaired students can thrive. Adequate lighting, clear signage, and well-designed classrooms contribute to our sense of safety, autonomy, and belonging. As another visually impaired student emphasized,

> "When physical infrastructure is thoughtfully designed with our needs in mind, it sends a powerful message of inclusion and respect. It empowers us to focus on our studies without the added burden of navigating inaccessible environments." R08

Accessible infrastructure not only enhances visually impaired students' ability to participate in technology education programs but also reaffirms our right to inclusive education. Through thoughtful design and implementation, institutions can create environments where visually impaired students can fully engage with technology education and reach their academic potential.

The key informants were asked to indicate how physical infrastructure within the School of Computing and Informatics designed to cater to the accessibility needs of visually impaired students. From the results, they indicated that physical infrastructure within the School of Computing and Informatics was designed to prioritize accessibility by people with disabilities, with features such as ramps, elevators, and tactile signage contributing to a more inclusive environment. However, there is a need for improvements to ensure seamless navigation and usability for visually impaired students. One of the key informants indicated that

> "I'm afraid the physical infrastructure within the School of Computing and Informatics is not adequately designed to cater to the accessibility needs of visually impaired students." KII04

The key informants were asked to indicate whether there were any specific modifications or features in place to enhance the physical accessibility of technology education spaces for visually impaired students. From the results, they indicated that specific modifications include accessible computer labs equipped with adjustable desks, and ergonomic chairs. These features contribute to enhancing the physical accessibility of technology education spaces for visually impaired students. The presence of adjustable furniture and ergonomic design features to accommodate the diverse needs of visually impaired students. This includes designated areas with height-adjustable desks and ergonomic chairs, promoting comfort and accessibility for students with varying physical abilities. Additionally, the provision of quiet areas within the spaces allows visually impaired students to study or work without distraction. These features contribute to creating a supportive learning environment that caters to the specific needs of visually impaired students. However, there were no tactile signage and markers as one of the key informants stated.

> "Tactile signage and markers, including braille labels and tactile markers, are not commonly implemented within the School of Computing and Informatics to aid visually impaired students in navigating and identifying key areas within the spaces." KII17

The key informants were asked to indicate challenges they identified in the current physical infrastructure regarding accessibility for visually impaired students. From the findings, one common challenge highlighted across the responses is the inadequacy and inconsistency in tactile signage and braille labeling throughout the physical infrastructure. Visually impaired students encounter difficulties in navigating and orienting themselves within the spaces due to the lack of uniformity in these accessibility features. This inconsistency poses a significant barrier to independent mobility and access to information for visually impaired students. As stated by a representative from the Disability Resource Centre,

> "One challenge is the lack of uniformity in tactile signage and braille labeling across different areas within the spaces, which can lead to confusion and difficulty in orientation." KII08

The key informants also indicated that while efforts have been made to provide these spaces for visually impaired students, challenges such as suboptimal acoustics and soundproofing may impact the concentration and comfort of students. Additionally, issues with occasional obstacles or obstructions in pathways hinder the usability of these spaces for visually impaired students. Addressing these challenges requires proactive measures to ensure that quiet areas are conducive to study and free from physical barriers.

The key informants were asked to indicate improvements or modifications that could enhance the physical accessibility of technology education programs. One prominent theme highlighted across the responses is the importance of standardizing and enhancing signage within technology education spaces. The key informants emphasized the need for consistent tactile markers and braille labels throughout the spaces to facilitate independent navigation and orientation for visually impaired students. Standardization of signage would address the current inconsistencies and provide clear cues for students to navigate the environment effectively. Another prevalent theme is the provision of accessible entrances and pathways within the technology education spaces. The key informants show the importance of ensuring that all areas are equipped with features such as ramps, handrails, and automatic doors to facilitate ease of access for visually impaired students. Enhancing the accessibility of entrances and pathways would promote inclusivity and ensure that visually impaired students can enter and navigate the spaces independently.

4.7 The influence of Availability of Teaching and Learning Materials on the access to TEP

4.7.1 Descriptive Statistics on Availability of Teaching and Learning Materials

The respondents were asked to indicate their level of agreement with various statements on availability of teaching and learning materials. From the findings, as shown in Table 4.12, the respondents disagreed with the statement indicating that instructors in their institution use accessible teaching methods and materials for visually impaired students (Mean=2.196; Std. Deviation = 1.203). In addition, with a mean of 2.079 (Std. Deviation = 1.087), the respondents disagreed with the statement indicating that instructors consistently offer alternative formats for assignments and assessments that accommodate the needs of visually impaired students. Similarly, with a mean of 1.993 (Std. Deviation = 1.006), the respondents disagreed with the statement that instructors generally provide clear and concise explanations of concepts and procedures.

Additionally, with a mean of 1.962 (Std. Deviation = 0.925), the respondents disagreed with the statement that instructors often supplement visual materials with verbal descriptions and tactile aids.

Regarding instructional materials in technology education programs, the respondents disagreed, with a mean of 1.979 (Std. Deviation = 1.033), with the statement that they are available in accessible formats for visually impaired students. Similarly, with a mean of 2.000 (Std. Deviation = 0.986), the respondents disagreed with the statement that course textbooks and handouts are provided in Braille, audio, and large print formats. Moreover, with a mean of 2.120 (Std. Deviation = 1.018), the respondents disagreed with the statement that visual materials, such as diagrams, images, and charts, are generally accompanied by clear and concise verbal descriptions.

Regarding the accessibility of physical and digital content, the respondents disagreed, with a mean of 2.206 (Std. Deviation = 1.101), indicating that there may be variability in the accessibility of content to visually impaired students. Also, with a mean of 2.172 (Std. Deviation = 1.056), the respondents disagreed regarding whether visual content, such as images, diagrams, and charts, is consistently accompanied by clear and concise verbal descriptions. Similarly, with a mean of 2.021 (Std. Deviation = 0.953), the respondents disagreed regarding whether course materials, such as textbooks, handouts, and presentations, are consistently available in alternative formats, such as Braille, audio, and large print.

Table 4.12: Availability of Teaching and Learning Materials

Statements	Mean	Std. Deviation
Instructors in my institution use accessible teaching methods and materials for visually impaired students.	2.196	1.203
Instructors provide clear and concise explanations of concepts and procedures.	1.993	1.006
Instructors supplement visual materials with verbal descriptions and tactile aids.	1.962	.925
Instructors offer alternative formats for assignments and assessments that accommodate the needs of visually impaired students.	2.079	1.087
Instructional materials in my institution's technology education programs are available in accessible formats for visually impaired students.	1.979	1.033
Course textbooks and handouts are provided in Braille, audio, and large print formats.	2.000	.986
Visual materials, such as diagrams, images, and charts, are accompanied by clear and concise verbal descriptions.	2.120	1.018
Physical and digital content is accessible to visually impaired students.	2.206	1.101
Course materials, such as textbooks, handouts, and presentations, are available in alternative formats, such as Braille, audio, and large print.	2.021	.953
Visual content, such as images, diagrams, and charts, is accompanied by clear and concise verbal descriptions.	2.172	1.056

4.7.2 Inferential Statistics for Availability of Teaching and Learning Materials and Access to TEP

Pearson correlation analysis was used to assess the relationship between the availability of teaching and learning materials and access to TEP. The results of the correlation analysis were as presented in Table 4.13.

Table 4.13: Correlation Coefficients for Availability of Teaching and Learning Materials and Access to TEP

		Accessibility of Technology Education Programs among the visually impaired	**Availability of teaching and learning materials**
Accessibility of Technology Education Programs among the visually impaired	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	291	
Availability of teaching and learning materials	Pearson Correlation	.716**	1
	Sig. (2-tailed)	.000	
	N	291	291

The results show a strong positive correlation between the availability of teaching and learning materials and the accessibility of technology education programs among visually impaired individuals (r=0.716, p-value=0.000). It implies that institutions with better availability of teaching and learning materials tend to have more accessible technology education programs for visually impaired students.

Linear regression analysis was used to assess the weight of the influence of availability of teaching and learning materials on access to technology education programs among the visually impaired. As shown in Table 4.14, the R^2 was 0.375, indicating that approximately 37.5% of the variance in the accessibility of technology education programs among the visually impaired can be accounted for by availability of teaching and learning materials.

Table 4.14: Model Summary for Availability of Teaching and Learning Materials and Access to TEP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.612[a]	0.375	0.401	0.3001

a. Predictors: (Constant), Availability of teaching and learning materials

As shown in Table 4.15, the F-statistic is 166.019 was greater than f-critical of 2.372 from F-distribution table. In addition, a significance level (Sig.) less than a chosen alpha level (commonly 0.05) indicates that the regression model is statistically significant. Therefore, a Significance Level of 0.000 indicates that the regression model is highly significant. The results show that the regression model, which include availability of teaching and learning materials, is highly significant in explaining the variance in the accessibility of technology education programs among the visually impaired.

Table 4.15: ANOVA for Availability of Teaching and Learning Materials and Access to TEP

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.787	1	25.787	166.019	.000[b]
	Residual	44.889	289	0.155		
	Total	70.676	290			

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

b. Predictors: (Constant), Availability of teaching and learning materials

Regression equation was;

$Y = 1.205 + 0.278X_3 + \varepsilon$

The findings show that availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_3=0278, p-value=0.012). This means that for every one-unit increase in the availability of teaching and learning materials, the accessibility of technology education programs among the visually impaired is predicted to increase by 0.278 units. The

associated p-value (Sig.) is 0.012, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that the availability of teaching and learning materials significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Table 4.16 Regression Coefficients for Availability of Teaching and Learning Materials and Access to TEP

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.205	0.251		4.799	0.000
	Availability of teaching and learning materials	0.278	0.118	0.255	2.356	0.012

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

4.7.3 Qualitative for Availability of Teaching and Learning Materials and Access to TEP

The current and past visually impaired students at the University of Nairobi were requested to indicate how the availability of teaching and learning materials influences the accessibility of Technology Education Programs among the visually impaired in institutions of higher learning in Kenya. The respondents agreed that the availability of teaching and learning materials profoundly influences the accessibility of technology education programs in institutions of higher learning in Kenya. Access to accessible materials, such as textbooks in Braille, audio recordings, and digital content compatible with screen readers, is essential for their active participation in coursework and comprehension of complex technological concepts. As one visually impaired student insightfully remarked,

> "Accessible teaching and learning materials are the keys that unlock the doors to knowledge for us. Without them, we are left stranded, unable to fully engage with the curriculum and grasp the intricacies of technology education." R23

The provision of alternative formats ensures that visually impaired students have equal opportunities to access educational content and contribute meaningfully to classroom discussions and projects.

Further, the availability of teaching and learning materials in accessible formats not only facilitates their academic success but also fosters a sense of inclusivity and belonging within the learning environment. When materials are provided in formats tailored to their needs, it signals a commitment to their equitable participation in Technology Education Programs. As another visually impaired student aptly expressed,

> "Accessible materials demonstrate that our education matters, that our voices are heard, and that we are valued members of the academic community. They empower us to fully engage with the curriculum, express our ideas, and pursue our academic aspirations."R40

By prioritizing the availability of accessible materials, institutions of higher learning can create an inclusive and supportive environment where visually impaired students can thrive academically and contribute to the advancement of technology.

The key informants were requested to indicate the availability of teaching and learning materials impact the overall accessibility of technology education for visually impaired students. From the results, one prominent theme highlighted across the responses is the essential role of accessible teaching and learning materials in ensuring the overall accessibility of technology education for visually impaired students. The key informants emphasize that access to materials in alternative formats, such as Braille, audio, and electronic text, is crucial for visually impaired students to effectively engage with course content and participate in academic activities. Providing materials in alternative formats enables visually impaired students to access course materials independently and on an equal basis with their sighted peers.

The key informants were asked to indicate whether there are any specialized materials or formats provided to accommodate the needs of visually impaired students. From the results, the key informants indicated that the provision of a range of specialized materials and formats to accommodate the diverse needs of visually impaired students was very low. Participants emphasize the low availability of materials such as digital textbooks in accessible formats like Braille, audio, and electronic text. In addition, alternative formats for visual materials, including tactile diagrams and 3D models, were not provided.

> "In most of the courses related to technology education programs, specialized materials or formats to accommodate the needs of visually impaired students are not provided adequately. This is partially because they staff are not well trained on the needs of the visually impaired and how to address them" KII09

The key informants were also asked to indicate how teaching materials adapted or alternatives were provided to ensure that visually impaired students have equal accessible educational content in technology programs. From the results, the key informants indicated that teaching materials had not been adapted to ensure that visually impaired students have equal accessible educational content in technology programs. Teaching materials had not been adapted to ensure accessibility, utilizing screen reader-friendly formats and captioned videos was non-existing. Alternative formats like tactile graphics and audio recordings were not utilized ensure equal accessible educational content for visually impaired students. Continuous evaluation and refinement of teaching materials are necessary to meet the evolving needs of visually impaired students. Feedback from students and ongoing collaboration with disability support services are invaluable for identifying areas for improvement and implementing effective solutions.

4.8 The influence of Assistive Technologies on the access to TEP

4.8.1 Descriptive Statistics on Assistive Technologies

The respondents were asked to indicate their level of agreement with various statements on assistive technologies. Regarding the knowledge of technical support staff about assistive technologies and the needs of visually impaired students, as shown in Table 4.17, the respondents disagreed, with a mean of 2.959 (Std. Deviation = 1.381). With a mean of 2.247 (Std. Deviation = 1.145), the respondents disagreed with the statement regarding whether technical support staff are proactive in identifying and addressing the technical needs of visually impaired students. Also, with a mean of 1.990 (Std. Deviation = 0.919), the respondents disagreed with the statement that visually impaired students in their institution have access to timely and effective technical assistance.

With a mean of 2.196 (Std. Deviation = 1.129), the respondents disagreed with the statement regarding whether visually impaired students have access to the assistive technology tools they need to succeed in their technology education programs. Similarly, with a mean of 1.990 (Std. Deviation

= 0.922), the respondents disagreed with the statement that the institution provides adequate funding for the purchase and maintenance of assistive technology tools. Regarding the availability of assistive technology tools, the respondents disagreed, with a mean of 1.797 (Std. Deviation = 0.811), that there is a sufficient number and variety of tools available to visually impaired students in their institution.

With a mean of 2.137 (Std. Deviation = 1.041), the respondents disagreed regarding whether regular maintenance and updates are performed to ensure the ICT infrastructure remains accessible to visually impaired students. Regarding the accessibility of the ICT infrastructure, the respondents disagreed, with a mean of 2.003 (Std. Deviation = 0.966), suggesting that there may be variability in the accessibility and inclusivity of the infrastructure for visually impaired students. Similarly, with a mean of 2.024 (Std. Deviation = 1.038), the respondents disagreed with the statement regarding whether computer workstations, software, and online resources are consistently compatible with assistive technologies such as screen readers and Braille devices.

Table 4.17: Assistive Technologies

Statements	Mean	Std. Deviation
Visually impaired students in our institution have access to timely and effective technical assistance	1.990	.919
Technical support staff is knowledgeable about assistive technologies and the needs of visually impaired students.	2.959	1.381
Technical support staff is proactive in identifying and addressing the technical needs of visually impaired students.	2.247	1.145
There is a sufficient number and variety of assistive technology tools available to visually impaired students in our institution.	1.797	.811
The institution provides adequate funding for the purchase and maintenance of assistive technology tools.	1.990	.922
Visually impaired students have access to the assistive technology tools they need to succeed in their technology education programs.	2.196	1.129
The ICT infrastructure in my institution is accessible and inclusive for visually impaired students.	2.003	.966
Computer workstations, software, and online resources are compatible with assistive technologies such as screen readers and Braille devices.	2.024	1.038
Regular maintenance and updates are performed to ensure the ICT infrastructure remains accessible to visually impaired students.	2.137	1.041

4.8.2 Inferential Statistics for Assistive Technologies and Access to TEP

Pearson correlation analysis was used to assess the relationship between assistive technologies and access to TEP. The results of correlation analysis were as presented in Table 4.18.

Table 4.18: Correlation Coefficients for Assistive Technologies and Access to TEP

		Accessibility of Technology Education Programs among the visually impaired	Assistive technologies
Accessibility of Technology Education Programs among the visually impaired	Pearson Correlation	1	
	Sig. (2-tailed)		
	N	291	
Assistive technologies	Pearson Correlation	.801**	1
	Sig. (2-tailed)	.000	
	N	291	291

The results show a very strong positive correlation between the availability of assistive technologies and the accessibility of technology education programs among visually impaired individuals (r=0.801, p-value=0.000). It implies that institutions with better access to assistive technologies tend to have more accessible technology education programs for visually impaired students.

Linear regression analysis was used to assess the weight of the influence of assistive technologies on access to technology education programs among the visually impaired. As shown in Table 4.19, the R^2 was 0.709, indicating that approximately 70.9% of the variance in the accessibility of technology education programs among the visually impaired can be accounted for by assistive technologies.

Table 4.19: Model Summary for Assistive Technologies and Access to TEP

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.485[a]	0.235	0.218	0.4787

a. Predictors: (Constant), Assistive technologies

As shown in Table 4.20, the F-statistic is 194.895 was greater than f-critical of 2.372 from F-distribution table. In addition, a significance level (Sig.) less than a chosen alpha level (commonly 0.05) indicates that the regression model is statistically significant. Therefore, a Significance Level of 0.000 indicates that the regression model is highly significant. The results show that the regression

model, which includes assistive technologies is highly significant in explaining the variance in the accessibility of technology education programs among the visually impaired.

Table 4.20: ANOVA for Assistive Technologies and Access to TEP

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.444	1	29.444	194.895	.000[b]
	Residual	43.661	289	0.151		
	Total	73.105	290			

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

b. Predictors: (Constant), Assistive technologies

Regression equation was;

$Y = 1.205 + 0.432X_4 + \varepsilon$

The findings show that the availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_4=0.432, p-value=0.000). This means that for every one-unit increase in assistive technologies, the Accessibility of Technology Education Programs among the visually impaired is predicted to increase by 0.432 units. The associated p-value (Sig.) is 0.000, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that the availability of assistive technologies significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Table 4.21 Regression Coefficients for Assistive Technologies and Access to TEP

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.205	0.251		4.799	0.000
	Assistive technologies	0.432	0.144	0.410	3.000	0.000

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

4.8.3 Qualitative for Assistive Technologies and Access to TEP

The current and past visually impaired students at the University of Nairobi were requested to indicate how the availability of assistive technology influences the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The results indicated that assistive technologies play a pivotal role in enhancing the accessibility of Technology Education Programs in institutions of higher learning in Kenya. These innovative tools and devices empower them to overcome barriers and actively engage with digital content, software, and learning resources. As one visually impaired student stated,

> "Assistive technologies are like windows opening up new worlds of learning for us. They provide the tools we need to navigate the digital landscape, access information, and participate in technology education programs with confidence." R04

Screen readers, magnification software, refreshable Braille displays, and other assistive technologies enable us to access, interact with, and comprehend digital materials, ensuring equitable accessible educational resources. In addition, assistive technologies foster independence and autonomy among visually impaired students, enabling the visually impaired to take control of their learning experiences. With the support of these tools, the visually impaired can customize their learning environments to suit their individual needs and preferences. As another visually impaired student emphasized,

> "Assistive technologies empower us to be active participants in our education, rather than passive recipients. They give us the freedom to navigate digital content, complete assignments, and collaborate with peers independently, fostering a sense of self-reliance and agency." R56

By providing access to assistive technologies, institutions of higher learning empower visually impaired students to take ownership of their academic journeys and pursue their educational goals with confidence. Moreover, the integration of assistive technologies promotes inclusivity and diversity within the learning environment, enriching the educational experience for all students. When institutions prioritize the availability and accessibility of these tools, it sends a powerful

message of inclusion and equity. Assistive technologies create an environment where diversity is celebrated, and every student has the opportunity to succeed.

The key informants were asked to describe the availability of assistive technology within the School of Computing and Informatics to support visually impaired students. One prominent theme highlighted across the responses is the unavailability of a comprehensive range of assistive technologies within the School of Computing and Informatics to support visually impaired students. The key informants indicated that the school lacked various assistive devices, including screen readers, magnification software, Braille displays, tactile keyboards, and specialized hardware and software solutions.

They were also asked to indicate how integration of assistive technology contributes to the accessibility of technology education programs. From the results, the key informants indicated that the integration of assistive technology significantly contributes to the accessibility of technology education programs. Staff members receive training on the effective use of assistive technology and provide ongoing support to visually impaired students. This integration ensures that visually impaired students can participate fully in classroom activities, complete assignments, and collaborate with peers. As stated by a representative from the Staff in the School of Computing and Informatics,

> "By providing access to assistive technologies such as screen readers, magnification software, and Braille displays, visually impaired students can effectively access digital content, navigate software applications, and engage with course materials." KII10

The key informants also indicated that assistive technologies empower visually impaired students to pursue their academic goals independently, fostering a more inclusive learning environment. By providing training programs for both staff and students on the effective use of assistive technology tools, institutions ensure proficient use of these tools and maximize their benefits. This emphasis on independence and empowerment enables visually impaired students to succeed academically and pursue their career aspirations. As highlighted by a representative from the Disability Resource Centre Staff,

"The integration of assistive technology promotes independence and self-advocacy among visually impaired students, empowering them to succeed academically and pursue their career aspirations." KII11

The key informants were also asked to indicate where there were training programs for both staff and visually impaired students regarding the effective use of assistive technology in the learning environment. From the results, they only had one session of training on use of assistive technology in the learning environment, which was held in the year 2019. Therefore, the students and the staff were not receiving training on navigating software interfaces, customizing accessibility settings, and troubleshooting technical issues. These programs are aimed at ensuring that both staff and visually impaired students can effectively utilize assistive technology in the learning environment.

4.9 Accessibility of Technology Education Programs among the visually impaired

The respondents were asked to indicate their level of agreement with various statements on accessibility of technology education programs among the visually impaired. Regarding barriers faced by visually impaired students limiting their enrollment in technology education programs, the respondents strongly agreed, with a mean of 4.062 (Std. Deviation = 0.918). Similarly, with a mean of 4.089 (Std. Deviation = 0.924), the respondents strongly agreed that efforts to increase the number of visually impaired individuals in technology education programs are minimal. However, with a mean of 2.354 (Std. Deviation = 1.293), the respondents disagreed that the number of visually impaired individuals enrolled in technology education programs has been increasing in the last five years.

Moreover, with a mean of 4.247 (Std. Deviation = 0.766), the respondents strongly agreed that technology education programs should prioritize accessibility for visually impaired individuals in their design and implementation. In addition, with a mean of 4.096 (Std. Deviation = 0.881), the respondents agreed that the availability of technology education programs accessible to visually impaired individuals is limited. In addition, with a mean of 3.876 (Std. Deviation = 0.960), the respondents agreed that the number of programs accessible to visually impaired students has increased over time, but there is still room for improvement.

Regarding the success of past visually impaired students in technology education programs

transitioning into careers in STEM fields, the respondents strongly agreed, with a mean of 4.189 (Std. Deviation = 0.840). Similarly, with a mean of 4.107 (Std. Deviation = 0.870), the respondents strongly agreed that the experiences of past visually impaired students in technology education programs serve as positive examples for current students. Also, with a mean of 3.952 (Std. Deviation = 0.912), the respondents agreed that the success stories of past visually impaired students in technology education programs inspire confidence and motivation among current students.

Table 4. 22: Accessibility of Technology Education Programs among the visually impaired

Statements	Mean	Std. Deviation
The number of visually impaired individuals enrolled in technology education programs has been increasing in the last five years	2.354	1.293
Visually impaired students face barriers that limit their enrollment in technology education programs.	4.062	.918
Efforts to increase the number of visually impaired individuals in technology education programs are minimal	4.089	.924
The availability of technology education programs accessible to visually impaired individuals is limited.	4.096	.881
Technology education programs should prioritize accessibility for visually impaired individuals in their design and implementation.	4.247	.766
The number of programs accessible to visually impaired students has increased over time, but there is still room for improvement.	3.876	.960
Past visually impaired students in technology education programs have successfully transitioned into careers in STEM fields.	4.189	.840
The experiences of past visually impaired students in technology education programs serve as positive examples for current students.	4.107	.870

The success stories of past visually impaired students in technology education programs inspire confidence and motivation among current students.	3.952	.912

The key informants were asked to indicate the number of visually impaired students that had enrolled in Technology Education Programs. The responses provided varied estimates of the number of visually impaired students enrolled in technology education programs, ranging from approximately 15 to 20 students. These estimates suggest that there is an insignificant population of visually impaired students within these programs, highlighting the importance of ensuring accessibility and support services tailored to their needs. The key informants were also asked to indicate the number of technology education programs that are accessible to visually impaired. From the findings, the key informants indicated that 3 technology education programs in the School of Computing and Informatics in the University of Nairobi were accessible to the visually impaired. In addition, the key informants were asked to indicate the number of visually impaired students that had done technology education programs. The responses provided varied estimates of the number of visually impaired students that had done technology education programs, ranging from approximately 200 to 300 students. This shows that there is a need to accommodate visually impaired students in technology education programs.

4.10 Overall model for Factors Influencing Access to TEPs for the Visually Impaired

The study used multivariate regression model to assess factors influencing access to TEPs for the visually impaired. As shown in Table 4.23, the R^2 was 0.709, indicating that approximately 70.9% of the variance in the accessibility of technology education programs among the visually impaired can be accounted for by the predictors included in the model. The predictors included availability of trained staff, institutional physical infrastructure, availability of teaching and learning materials and assistive technologies.

Table 4. 23: Model Summary for Factors Influencing Access to TEPs for the Visually Impaired

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate

1	.854[a]	0.709	0.684	0.14013

a. Predictors: (Constant), Assistive technologies , Availability of Trained Staff , Institutional infrastructure , Availability of teaching and learning materials

The ANOVA results provide information about the overall fit of the regression model and the significance of the predictors in explaining the variance in the dependent variable (Accessibility of Technology Education Programs among the visually impaired). In this case, the F-statistic is 488.245 was greater than F-critical of 2.372 from F-distribution table. In addition, a significance level (Sig.) less than a chosen alpha level (commonly 0.05) indicates that the regression model is statistically significant. Therefore, a Significance Level of 0.000 indicates that the regression model is highly significant. The results show that the regression model, which includes the predictors assistive technologies, availability of trained staff, institutional infrastructure, and availability of teaching and learning materials, is highly significant in explaining the variance in the accessibility of technology education programs among the visually impaired.

Table 4. 24: ANOVA for Factors Influencing Access to TEPs for the Visually Impaired

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	28.168	4	7.042	488.245	.000[b]
	Residual	4.125	286	0.014		
	Total	32.293	290			

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

b. Predictors: (Constant), Assistive technologies , Availability of Trained Staff , Institutional infrastructure , Availability of teaching and learning materials

Regression equation was;

$$Y = 1.205 + 0.509X_1 + 0.368X_2 + 0.278X_3 + 0.432X_4 + \varepsilon$$

The findings show that availability of trained staff has a positive and significant effect on the access to technology education programs among the visually impaired in institutions of higher learning in Kenya (β_1=0.529, p-value=0.000). This means that for every one-unit increase in the availability of trained staff, the Accessibility of Technology Education Programs among the visually impaired is predicted to increase by 0.529 units. The associated p-value (Sig.) is 0.000, which is less than 0.05.

This indicates that the coefficient is statistically significant, suggesting that the availability of trained staff significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

In addition, physical infrastructure has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_2=0.399, p-value=0.001). This means that for every one-unit increase in institutional infrastructure, the Accessibility of technology education programs among the visually impaired is predicted to increase by 0.399 units. The associated p-value (Sig.) is 0.001, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that institutional infrastructure significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Further, availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_3=0287, p-value=0.012). This means that for every one-unit increase in the availability of teaching and learning materials, the accessibility of technology education programs among the visually impaired is predicted to increase by 0.287 units. The associated p-value (Sig.) is 0.012, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that the availability of teaching and learning materials significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Also, the findings show that the availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya (β_4=0.441, p-value=0.000). This means that for every one-unit increase in assistive technologies, the Accessibility of Technology Education Programs among the visually impaired is predicted to increase by 0.441 units. The associated p-value (Sig.) is 0.000, which is less than 0.05. This indicates that the coefficient is statistically significant, suggesting that the availability of assistive technologies significantly predicts the Accessibility of Technology Education Programs among the visually impaired.

Table 4. 25: Regression Coefficients for Factors Influencing Access to TEPs for the Visually Impaired

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.119	0.249		4.494	0.000
	Availability of Trained Staff	0.529	0.136	0.499	3.890	0.000
	Institutional infrastructure	0.399	0.124	0.389	3.218	0.001
	Availability of teaching and learning materials	0.287	0.112	0.277	2.563	0.012
	Assistive technologies	0.441	0.143	0.456	3.084	0.000

a. Dependent Variable: Accessibility of Technology Education Programs among the visually impaired

4.11 Chapter Summary

The chapter commences with an overview of the questionnaire response rate, indicating a robust 87.64% response rate, above the accepted threshold for effective analysis and reporting. Subsequently, the chapter delves into the demographic data, revealing insights into the gender distribution, age brackets, student status, education levels, and courses undertaken by the respondents. Notably, the majority of respondents were female, younger in age, recent graduates, pursuing bachelor's degrees, and enrolled in non-technology-related courses.

Furthermore, the chapter provides detailed descriptive statistics on various aspects related to the accessibility of technology education programs among the visually impaired. This includes analyses on the availability of trained staff, institutional infrastructure, teaching and learning materials, and assistive technologies. The findings show the significant influence of these factors on the accessibility of technology education programs, with correlations and regression analyses revealing strong positive relationships and predictive capabilities. Specifically, the availability of trained staff, institutional infrastructure, teaching and learning materials, and assistive technologies emerged as key predictors positively impacting the accessibility of technology education programs among the visually impaired.

These findings underscore the importance of addressing these factors to enhance accessibility and inclusivity in higher education settings for visually impaired individuals in Kenya.

CHAPTER FIVE
DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents discussion of the findings, conclusions and recommendations for practice and policy as well as recommendation for further studies. The main purpose of the study was to examine factors (availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology) influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

5.2 Summary of the Findings

The study found that availability of trained staff has a positive and significant effect on the access to technology education programs among the visually impaired in institutions of higher learning in Kenya. However, findings reveal a significant shortfall in the number of adequately trained staff members, highlighting a notable barrier to the academic success of visually impaired students. The existing ratio of trained staff to visually impaired students is deemed inadequate to ensure effective support, underscoring the pressing need for improvement in this area. addition, despite their comfort in interacting with visually impaired students, staff members lack sufficient knowledge and training to address the specific needs of this demographic, including adapting teaching methods and utilizing assistive technologies like Braille. While some staff members have undergone training programs covering relevant topics such as disability awareness and accessible design principles, the majority still lack the necessary preparation to meet the diverse needs of visually impaired students in technology education programs.

The study established that physical infrastructure has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. While some aspects of institutional infrastructure, such as the arrangement of furniture and equipment in laboratories and classrooms, are conducive to accessibility, significant gaps remain. Uneven pathways, lack of tactile signage, and poorly equipped classrooms isolate visually impaired students and impede their access to essential learning materials and equipment. Additionally, inadequate lighting, unclear signage, and inaccessible library services further compound these challenges, underscoring the pressing need for improvements in physical

infrastructure to foster inclusivity and ensure inclusive education. Efforts within the School of Computing and Informatics have been made to prioritize accessibility for people with disabilities through features like ramps, elevators, and adjustable furniture. Inadequate ramps and accessibility features make it difficult for visually impaired students to navigate public spaces, buildings, and campuses. Specific modifications, such as accessible computer labs equipped with adjustable desks and ergonomic chairs, contribute to enhancing the physical accessibility of technology education spaces. The absence of tactile signage and markers highlights the ongoing need for comprehensive design considerations that accommodate the diverse needs of visually impaired students.

The study found that availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The accessibility of teaching and learning materials profoundly impacts technology education programs in Kenyan higher learning institutions, particularly for visually impaired students. Access to materials like Braille textbooks, audio recordings, and digital content compatible with screen readers is vital for their active engagement in coursework and understanding of complex technological concepts. However, instructors often fail to utilize accessible teaching methods and materials tailored to the needs of visually impaired students, including offering alternative formats for assignments and assessments, providing clear explanations of concepts, and supplementing visual materials with verbal descriptions and tactile aids. The availability of teaching and learning materials in accessible formats not only facilitates the academic success of visually impaired students but also fosters inclusivity and a sense of belonging within the learning environment. However, the current provision of specialized materials, such as digital textbooks and tactile diagrams, remains inadequate, highlighting the ongoing need for improvements to meet the diverse needs of visually impaired students.

The findings show that the availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. Screen readers, magnification software, and refreshable Braille displays empower students to access and interact with digital materials, promoting independence and autonomy in their learning experiences. Challenges persist regarding technical support and access to timely assistance for technical issues in institution of higher learning in Kenya. Additionally, essential tools for individuals with hearing impairment, such as closed caption decoders, hard-wired systems,

personal FM systems, and telecommunication devices, were lacking. The study found that insufficient funding and maintenance contribute to the limited availability of assistive technology tools, hindering students' access to essential resources. Moreover, compatibility issues between computer workstations, software, and assistive technologies further impede the accessibility of digital resources for visually impaired students.

5.3 Discussion of the Findings

This section presents the discussion of the findings on the effect of availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology on accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

5.3.1 Availability of Trained Staff and Access to TEPs among the Visually Impaired

The study found that availability of trained staff has a positive and significant effect on the access to technology education programs among the visually impaired in institutions of higher learning in Kenya. These findings agree with Yeo and Huan (2019) observation that trained staff members within Kenyan higher education institutions are indispensable for facilitating access to technology education programs, particularly for visually impaired students. They serve as essential pillars, providing customized support and guidance that are crucial for the inclusive participation of visually impaired individuals in academic endeavors. The findings also agree with Ferreira and Manis (2022) findings that availability of trained staff played a key role in addressing equity for learners with visual impairment among schools. The findings are also in concurrence with Josua et al. (2022) findings that trained staff members play a multifaceted role in nurturing an inclusive learning environment wherein visually impaired students can flourish academically and beyond.

However, findings reveal a significant shortfall in the number of adequately trained staff members, highlighting a notable barrier to the academic success of visually impaired students. The existing ratio of trained staff to visually impaired students is deemed inadequate to ensure effective support, underscoring the pressing need for improvement in this area. The findings are in line with Yeo and Huan (2019) observation that instructional difficulties in catering adequately to diverse needs in the same classroom were a significant source of stress for teachers. In addition,

despite their comfort in interacting with visually impaired students, staff members lack sufficient knowledge and training to address the specific needs of this demographic, including adapting teaching methods and utilizing assistive technologies like Braille. The findings agree with Ferreira and Manis (2022) observation that teachers were not sufficiently prepared to fulfil this responsibility as they had not received special training on working with visually impaired learners.

While some staff members have undergone training programs covering relevant topics such as disability awareness and accessible design principles, the majority still lack the necessary preparation to meet the diverse needs of visually impaired students in technology education programs. These findings concur with Silas et al. (2022) observation that the integration of students with low vision into the instruction of technical subjects was not efficiently carried out, primarily because most teachers lacked the training to address the needs of learners with special educational requirements, particularly the visually impaired, during their college or university education. Dea and Negassa (2019) recognized need for more frequent and comprehensive training sessions to adequately prepare staff members to support the unique needs of visually impaired students effectively.

5.3.2 Institutional infrastructure and Access to TEPs among the Visually Impaired

The study established that physical infrastructure has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The findings agree with Amin et al. (2021) findings that physical infrastructure in higher education institutions was important in ensuring inclusion of students with visual impairments. The findings are also in agreement with Ackah and Danso (2019) findings that physical environment of inclusive schools plays a key role in ensuring inclusive education. Similarly, the findings are in concurrence with Gikunju et al. (2023) who emphasizes on the improvement of physical access to infrastructure in learning institutions as a way of ensuring inclusive education.

While some aspects of institutional infrastructure, such as the arrangement of furniture and equipment in laboratories and classrooms, are conducive to accessibility, significant gaps remain. Uneven pathways, lack of tactile signage, and poorly equipped classrooms isolate visually impaired students and impede their access to essential learning materials and equipment. These findings agree with Wandera et al. (2019) observation that most of the facilities in the universities including lecture rooms, laboratories and hostels were inaccessible to the visually impaired. Additionally, inadequate

lighting, unclear signage, and inaccessible library services further compound these challenges, underscoring the pressing need for improvements in physical infrastructure to foster inclusivity and ensure inclusive education.

Efforts within the School of Computing and Informatics have been made to prioritize accessibility for people with disabilities through features like ramps, elevators, and adjustable furniture. These findings are in line with Kumari and Kaur (2020) argument that visually impaired students encountered issues related to inadequate infrastructure, such as insufficient ramps, premises, transportation, unfriendly washrooms, difficulties in walking on roads, and challenges in crossing roads, among other concerns. Inadequate ramps and accessibility features make it difficult for visually impaired students to navigate public spaces, buildings, and campuses.

According to Amin et al. (2021), lack of ramps or elevators makes it difficult for individuals with mobility impairments, including those with visual impairments, to access buildings with multiple floors. Specific modifications, such as accessible computer labs equipped with adjustable desks and ergonomic chairs, contribute to enhancing the physical accessibility of technology education spaces. The absence of tactile signage and markers highlights the ongoing need for comprehensive design considerations that accommodate the diverse needs of visually impaired students. As observed by Amin et al. (2021), visually impaired individuals rely on tactile or auditory cues for navigation. Lack of accessible signage can lead to disorientation and difficulty finding classrooms, offices, and facilities. The findings also also in agreement with Gikunju et al. (2023) findings that libraries lacked tactile or auditory signage, which posed challenges for visually impaired individuals to navigate the library independently.

5.3.3 Availability of Teaching and Learning Materials and Access to TEPs among the Visually Impaired

The study found that availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The accessibility of teaching and learning materials profoundly impacts technology education programs in Kenyan higher learning institutions, particularly for visually impaired students. Access to materials like Braille textbooks, audio

recordings, and digital content compatible with screen readers is vital for their active engagement in coursework and understanding of complex technological concepts. The findings are in line with Holt et al. (2019) observation that learning material, including a guide to further reading, offer educators a comprehensive reference for additional insights when teaching students with visual impairment. The findings also agree with Ferreira and Manis (2022) findings that teaching and learning materials play an important role in addressing equity for learners with visual impairment in schools in South Africa.

However, instructors often fail to utilize accessible teaching methods and materials tailored to the needs of visually impaired students, including offering alternative formats for assignments and assessments, providing clear explanations of concepts, and supplementing visual materials with verbal descriptions and tactile aids. These findings agree with Wandera et al. (2019) findings that the methods of instruction and assessment used and the instructional materials provided were a major challenge to the visually impaired students. The availability of teaching and learning materials in accessible formats not only facilitates the academic success of visually impaired students but also fosters inclusivity and a sense of belonging within the learning environment. However, the current provision of specialized materials, such as digital textbooks and tactile diagrams, remains inadequate, highlighting the ongoing need for improvements to meet the diverse needs of visually impaired students. These findings agree with Akakandelwa and Munsanje (2022) findings that majority of schools in Zambia fell short in providing sufficient and suitable learning and teaching materials for pupils with visual impairment. In addition, Oyebanji and Idiong (2021) observed that visually impaired students often rely on specialized materials and resources to access mathematical concepts and content. In addition, the lack of appropriate instructional materials leads to inequities in education.

Ensuring the provision of alternative formats enables visually impaired students to access course materials independently and on an equal basis with their sighted peers. However, participants in the study emphasized the limited availability of specialized materials, such as digital textbooks in accessible formats like Braille, audio, and electronic text. Additionally, alternative formats for visual materials, including tactile diagrams and 3D models, were lacking. The findings are contrary to Ferreira and Manis (2022) findings that highlighted the need for teaching and learning materials in Braille and enlarged font to cater to the unique requirements of visually impaired learners. Moreover,

the study highlighted various supportive equipment, including voice recorders, specialized teaching aids, embossers, magnifying glasses, reading monitors, and braillers.

5.3.4 Assistive Technologies and Access to TEPs among the Visually Impaired

The findings show that the availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. Screen readers, magnification software, and refreshable Braille displays empower students to access and interact with digital materials, promoting independence and autonomy in their learning experiences. The findings agree with Kori and Mulla (2021) findings that of ICT is important in providing user-friendly and adequate services for visually impaired students. The findings are also in concurrence with Mahawariya (2019) findings that assistive technology is important in enhancing inclusive education among visually impaired students in institutions of higher learning. Also, the findings are in concurrence with Alabi and Mutula (2020) argument that digital inclusion through assistive technologies in academic libraries was important in enhancing the inclusion of visually impaired students.

Challenges persist regarding technical support and access to timely assistance for technical issues in institution of higher learning in Kenya. The findings are in line with Chimhenga (2019) observation that there exists deficiencies in the library's resources, including the absence of contemporary equipment such as computers with JOS connected to the Internet, Braille books, books on cassette or CDs designed for students with visual impairment. Additionally, essential tools for individuals with hearing impairment, such as closed caption decoders, hard-wired systems, personal FM systems, and telecommunication devices, were lacking. The findings are also in line with McNicholl et al. (2021) findings that limitations and inadequacies of AT devices can pose challenges for SWDs.

The study found that insufficient funding and maintenance contribute to the limited availability of assistive technology tools, hindering students' access to essential resources. The findings are in concurrence with Adongo (2023) observation that inadequacy of funds was one of the main challenges in obtaining assistive technologies. Additionally, compatibility issues between computer workstations, software, and assistive technologies further impede the accessibility of digital resources for visually impaired students. This is supported by Alabi and Mutula (2020) findings that the ICT

infrastructure in institutions of higher learning was not compatible with assistive technologies. In addition Limited training sessions and outdated training programs hinder students and staff from maximizing the benefits of assistive technologies, emphasizing the need for ongoing education on navigating interfaces, customizing settings, and troubleshooting technical issues.

5.4 Conclusions

The study concludes that availability of trained staff has a positive and significant effect on the access to technology education programs among the visually impaired in institutions of higher learning in Kenya. The study found that number of trained staff, qualification of teachers and training of staff to hand visually impaired influence access to technology education programs among the visually impaired. The findings imply that an improvement in availability of trained staff would lead to an improvement in accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

The study also concludes that physical infrastructure has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The study found that architectural design of facilities, accessible classrooms and laboratories and accessible library services have an influence on access to technology education programs among the visually impaired. The findings show that an improvement in physical infrastructure would lead to an improvement in accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

Further, the study concludes that availability of teaching and learning materials has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. The findings indicated that teaching methods, availability of instructional materials and accessible physical and digital content have an influence on access to technology education programs among the visually impaired. The findings suggest that an improvement in availability of teaching and learning materials would lead to an improvement in accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

Also, the study concludes that availability of assistive technology has a positive and significant effect on the accessibility of technology education programs among the visually impaired in institutions of

higher learning in Kenya. The study found that technical assistance, number of assistive technology tools and ICT infrastructure have an influence on access to technology education programs among the visually impaired. These findings imply that an improvement in availability of assistive technology would lead to an improvement in accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya.

5.5 Limitations of the Study

The research encountered various challenges in the data collection phase. First, accessing visually impaired posed challenge a challenge to data collection as they were not located in one place. However, list of VI individuals was obtained from PVI associations, which include Kenya Union of the Blind (KUB), Kenya Society for the Blind (KSB), Maendeleo Ya Kipofu (MYK), Blind Empowerment Society of Kenya (DESK) and Kenya Institute for the Blind (KIB). Moreover, employees within the School of Computing and Informatics, along with the Disability Resource Centre at the University of Nairobi, might exhibit reluctance to engage in the study due to concerns about being under scrutiny. Nevertheless, the presentation of the letter of data collection and the research permit from the National Commission for Science, Technology & Innovation (NACOSTI) reassured respondents that the gathered data serves an academic purpose exclusively.

5.6 Recommendations

Managerial Recommendations

Given the significant barrier posed by insufficient numbers of trained staff, the university should prioritize ongoing training programs for staff members. These programs should focus on enhancing their ability to support visually impaired students effectively. Staff members should receive training in disability awareness, specialized teaching methods, and the use of assistive technologies. Regular workshops and seminars can keep staff updated on best practices and ensure they are equipped to address the unique needs of visually impaired students. The university should consider hiring additional staff members with expertise in supporting students with disabilities or reallocating resources to prioritize support services. By ensuring a sufficient number of trained staff members, the university can enhance the overall support available to visually impaired students.

While the architectural design of the institution's facilities is generally accessible, there is a lack of tactile surfaces and signage, which are essential for visually impaired students to navigate

independently. The university should prioritize the installation of tactile surfaces and signage throughout the campus, including in classrooms, laboratories, restrooms, and common areas. This will enhance the safety and autonomy of visually impaired students and ensure equal access to facilities. In addition, the inconsistent lighting in classrooms and laboratories can hinder the ability of visually impaired students to perceive information effectively. The university should conduct assessments to identify areas where lighting can be improved to better accommodate the needs of visually impaired students. Additionally, environmental design considerations, such as color contrast and acoustics, should be taken into account to create a more inclusive learning environment for visually impaired students.

The School of Computing and Informatics in the University of Nairobi should implement training programs for instructors aimed at promoting the use of accessible teaching methods and materials for visually impaired students. This training should focus on strategies for creating alternative formats for assignments, assessments, textbooks, handouts, and presentations, such as Braille, audio recordings, and large print. Instructors should also be encouraged to provide clear verbal descriptions and tactile aids to supplement visual materials, ensuring that all students, including those with visual impairments, can effectively engage with course content. The university should also establish protocols to ensure that course materials are consistently available in alternative formats, thereby addressing the current low availability reported by respondents.

The University of Nairobi should allocate adequate funding for the purchase and maintenance of a comprehensive range of assistive technology tools within the School of Computing and Informatics. This includes essential tools such as screen readers, magnification software, Braille displays, tactile keyboards, and specialized hardware and software solutions. Additionally, the university should prioritize regular maintenance and updates of ICT infrastructure to ensure compatibility with assistive technologies like screen readers and Braille devices. The university should also implement regular training sessions for technical support staff to enhance their knowledge about assistive technologies and the specific needs of visually impaired students. These training sessions should focus on identifying and addressing technical needs promptly, as well as providing timely and effective technical assistance to visually impaired students.

Policy Recommendations

The government of Kenya through the Ministry of Education should implement regulations that set minimum accessibility standards for physical infrastructure in institutions of higher learning. These standards should require institutions to adhere to accessibility guidelines for buildings, pathways, classrooms, and common areas to ensure they are fully accessible to visually impaired students. The government can enforce these regulations through regular inspections and accreditation processes, holding institutions accountable for maintaining accessible infrastructure.

The government should allocate funding specifically for the development and provision of accessible teaching and learning materials for visually impaired students in institutions of higher learning. The government can establish grant programs or funding schemes to support the creation of materials in alternative formats such as Braille, audio, and large print. Additionally, policies should encourage the adoption of accessible teaching methods and the integration of tactile aids to enhance the accessibility of course materials.

The Ministry of Education should invest in research and development initiatives aimed at advancing assistive technologies for visually impaired students. The government can allocate resources to support universities and research institutions in developing innovative assistive technologies tailored to the needs of visually impaired students. Additionally, policies should promote the affordability and availability of assistive technologies by providing subsidies or tax incentives to manufacturers and suppliers.

5.7 Suggestions for Further Studies

The main purpose of the study was to examine factors influencing the accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. However, the research was limited to only four factors, which included availability of trained staff, physical infrastructure, availability of teaching and learning materials and availability of assistive technology. The study found that 70.9% of the variation in the performance of accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya could be explained by the four factors. Hence, the study recommends that further study should be conducted so as to assess other factors including accessibility of technology education programs among the visually impaired in institutions of higher learning in Kenya. In addition, this study was conducted in the School of Computing and Informatics in the University of Nairobi and hence the

findings cannot be generalized to other universities in Kenya. As such, comparative studies should be conducted in other institutions of higher learning in Kenya.

REFERENCES

Adli, S. N., & Chowdhury, S. (2021). A critical review of social justice theories in public transit planning. *Sustainability, 13*(8), 4289.

Adongo, J. O. (2023). The inclusion of students with visual impairment in tertiary institutions: a case study of teachers' training college at Machakos, Kenya (Doctoral dissertation).

Akakandelwa, A., & Munsanje, J. (2022). Provision of learning and teaching materials for pupils with visual impairment: Results from a National Survey in Zambia. *British Journal of Visual Impairment, 30*(1), 42-49. https://doi.org/10.1177/0264619611428729

Amin, A. S., Sarnon, N., Akhir, N. M., Zakaria, S. M., & Badri, R. (2021). Main challenges of students with visual impairment at higher education institutions. International Journal of Academic Research in Business and Social Sciences, 10(1), 734-747.

Anyango, R. N. & Okello, L. M. (2023). Influence of the Attitude of Teachers on Academic Performance of Visually Impaired Learners in Primary Schools of Rongo Sub-County, Kenya. European Journal of Special Education Research, 12, 1-18.

Bell, B. & Silverman, A. M. (2019). Access to Math and Science Content for Youth Who Are Blind or Visually Impaired. Journal of Blindness Innovation and Research, 9(1), 90-112.

Bhattacherjee, A. (2018). Social Science Research: Principles, Methods, and Practices. New York: Free Press.

Capeheart, L., & Milovanovic, D. (2020). Social justice: Theories, issues, and movements. Rutgers University Press.

Chaichompu, R. ., Tongsookdee , R. ., Vittayakorn, S. ., & Leosiripong, P. . (2022). Factors affecting educational opportunities and accessibility of an individual with deafblindness. Journal of Ratchasuda College for Research and Development of Persons with Disabilities, 18(2), 57–75. Retrieved from https://so03.tci-thaijo.org/index.php

Chikukwa, H. T., Chabaya, R. A. & Mupa, P. D. (2022). The Forgotten Tribe in ODL Systems: Challenges Faced by Visually Impaired Students in Institutions of Higher Learning. Huria: Journal of the Open University of Tanzania, 13(2), 101-122.

Chimhenga, S. (2019). Accessing Library Services in Institutions of Higher Learning: The Experiences of Zimbabwe Open University Students with Disabilities. European Journal of Special Education Research, 2(5), 61-79.

Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. Performance Improvement, 60(3), 6-14.

Creswell, W. & Creswell, D. (2022). Research design: Qualitative, quantitative, and mixed methods approaches. New York: SAGE Publications, Inc.

Davis, F. D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. MIS Quarterly, 13(3), 319-339.

Devi, P. S. (2019). Research methodology: A handbook for beginners. New Delhi: Notion Press.

Dudar, V. L., Riznyk, V. V., & Kovtun, O. A. (2021). Use of modern technologies and digital tools in the context of distance and mixed learning. Linguistics and Culture Review, 5(S2), 733-750.

Eligi, I. & Mwantimwa, K. (2017). ICT accessibility and usability to support learning of visually-impaired students in Tanzania. International Journal of Education and Development using Information and Communication Technology, 13(2), 87-102.

Ferreira, K. & Manis, M. (2022). Addressing Equity for Learners with Visual Impairment through Inclusive Education Policy Implementation in South African Schools. Sabinet African Journals, 39, 141-167.

Gikunju, M., Odero, D., & Kwanya, T. (2023). Status of Access to Library Spaces and Facilities for Persons with Disabilities: A Case of Kenyan University Libraries. Journal of Arts and Humanities, 12(05), 01-12.

Granić, A., & Marangunić, N. (2019). Technology acceptance model in educational context: A systematic literature review. British Journal of Educational Technology, 50(5), 2572-2593.

Habulezi, J., Batsalelwang, P.J. & Malatsi, N. M. (2017). Factors Influencing the Poor Academic Performance of Learners with Vision Impairment in Science Subjects in Kgatleng District in Botswana. International Journal of Learning, Teaching and Educational Research, 16(11), 28-44.

Hair, J. O., Page, M. & Brunsveld, N. (2020). Essentials of Business Research Methods. London: Routledge

Haleem, A., Javaid, M. & Qadri, M.A. (2022). Understanding the role of digital technologies in education: A review. Sustainable Operations and Computers, 3, 275-285

Hall, R. (2020). Qualitative, Quantitative and Combined Methods: Mixing Methods in Social Research. New York: SAGE Publications Ltd.

Ionescu, D. (2023). Training Needs of Teachers on Inclusive Education. Journal of Management, 12, 1371-1381. 10.15405/epes.23045.140.

Ireri, B. & King'endo, M. (2020). Policy strategies for effective implementation of inclusive education in Kenya. International Journal of Educational Administration and Policy Studies, 12(1), 28-42.

Joseph, R. (2020). Toward a pragmatic understanding of Rawls' social justice theory in social work: A critical evaluation. Journal of Human Rights and Social Work, 5(3), 147-156.

Josua, L. M., Haihambo, C. K., & Likando, G. (2022). Challenges School Management Experience with Inclusion of Learners with Visual Impairments: A Case of a Secondary School in Namibia. Creative Education, 13, 3559-3580. https://doi.org/10.4236/ce.2022.1311227

Kamal, S. A., Shafiq, M., & Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). Technology in Society, 60, 101212.

Kemp, A., Palmer, E., & Strelan, P. (2019). A taxonomy of factors affecting attitudes towards educational technologies for use with technology acceptance models. British Journal of Educational Technology, 50(5), 2394-2413.

Koech, P.K. & Kimani, C. (2022). Influence of Learners' Readiness and Physical Facilities on Transition of Learners with Visual Impairment from Integrated Pre-primary to Primary Schools in Narok County, Kenya. Journal of Education, Society and Behavioural Science, 35(6), 54-65

Konga, D.J. & Cheboi, S.T. (2021). Influence of School Resources on Academic Performance of Visually Impaired Learners in Integrated Public Primary Schools in Baringo County, Kenya. European Journal of Special Education Research, 7(2), 170-182.

Kori, D., & Mulla, K. R. (2021). The Provision of Library Services and Facilities for Visually Impaired Students in Visually Impaired Schools in Karnataka: A Study. Indian Journals, 41(2), 234-240.

Kpodoe, I.A. & Ampratwum, J. (2019). Experiences of Students with Visual Impairment in Higher Education in Ghana: Bodily Perspective on Inclusive Education. Journal of Education and Practice, 10(18), 128-139.

Krishna, B. (2020). Guide to Research Methodology and Biostatitics. London: Rutledge.

Kumar, R. (2019). Research Methodology: A Step-by-Step Guide for Beginners. New York: SAGE Publications Ltd.

Kumari, S. & Kaur, A. (2020). Mapping the Social Issues in the Educational Domain: An Exploratory Study among Visually Disable Students. Journal of Emerging Technologies and Innovative Research, 7(3), 800-918.

Latwal, G.S. (2020). Research Methodology. Florida: CRC Press.

Long'ore, P. L., Cheloti, S. K., & Mwanza, R. (2023). Influence of physical facilities and instruction al materials on the teaching of special needs learners in public primary schools in Kenya. The strategic Journal of Business & Change Management, 10 (1), 523 – 532.

Lopez-Fernandez, O. (2021). Emerging health and education issues related to internet technologies and addictive problems. International Journal of Environmental Research and Public Health, 18(1), 321.

Mahawariya, K. (2019). A Study of Needs and Requirements of Visually Impaired Students of Uni versity of Delhi. International Journal of Information Dissemination and Technology, 9(2), 8 4-98.

McNicholl, A., Casey, H., Desmond, D., & Gallagher, P. (2021). The impact of assistive technology use for students with disabilities in higher education: a systematic review. Disability and Rehabilitation: Assistive Technology, 16(2), 130-143.

Ministry of Education (2009). The National Special Needs Education Policy Framework. Retrieved from http://www.gluk.ac.ke/down/specialneedseducationpolicy.pdf

Moriña, A. & Carballo, R. (2020). Training Needs of Academics on Inclusive Education and Disability. SAGE Open, 10(3). https://doi.org/10.1177/2158244020962758

Mukherjee, S.P. (2020). A Guide to Research Methodology: An Overview of Research Problems, Tasks and Methods. New York: CRC Press.

National Council for Persons with Disabilities (2022). Organisations and Agencies for Persons with Disabilities. Retrieved from https://ncpwd.go.ke

Ndiweni, M., Machimbidza, T. & Mutula, S. (2022). Factors influencing library use by students with disabilities in Zimbabwe: The case of United College of Education (UCE). Library Philosophy and Practice (e-journal), 1, 6896.

Nyambura, R. & Oigara, P. (2021). Influence of Teaching Skills and Training Methodology on Performance of Learners with Visual Impairment in Public Primary Schools in Narok West Sub-County, Kenya. East African Journal of Education Studies, 3(1), 1-6. https://doi.org/10.37284/eajes.4.1.421.

Omede, A. (2019). The challenges of educating the visually impaired and quality assurance in tertiary institutions of learning in Nigeria. International Journal of Educational Administration and Policy Studies, 7, 129-133. 10.5897/IJEAPS2015.0407.

Oranga, J., Chege, F. & Mugo, J. (2020). Success among Blind Students in Kenya: The Case of Kenyatta University. Journal of Special Needs and Disability Studies, 1, 77-88.

Oyebanji, M. S., & Idiong, U. S. (2021). Challenges of Teaching Mathematics to Students with Visual Impairment. Malikussaleh Journal of Mathematics Learning, 4(1), 1-6.

Rannikmäe, M. & Soobard, R. (2020). Social Constructivism—Jerome Bruner. Oxford Press.

Rawls, J. (1985). Justice as fairness: Political not metaphysical. Philosophy and Public Affairs, 14(3), 223–251.

Rawls J. (1985). Justice as fairness: political not metaphysical. Philosophy and Public Affairs, 14, 223-251.

Riley-Ancar, H. L. (2022). Accessibility Challenges of Online Learning Affecting Successful Degree Completion among Visually Impaired Undergraduate/Graduate Students: An Exploratory Case Study. Retrieved from https://www.proquest.com/

Seale, J., Colwell, C., & Olenik-Shemesh, D. (2021). 'Dreaming in colour': disabled higher education students' perspectives on improving design practices that would enable them to benefit from their use of technologies. Education and Information Technologies, 26, 1687-1719.

Silas, S., Mukawu, L. H., Matsvange, M. & Bandera, T. (2022). Effectiveness of Inclusivity in Technical Education: A Case of Visually Impaired Learners in Mashonaland East Province of Zimbabwe. East African Journal of Education and Social Sciences, 3(4), 46-53. Doi: https://dx.doi.org/10.4314/eajess.v3i4.196.

Sileyew, K. (2019). Research Design and Methodology. Washington DC: Intechopen.

Silva, J. C., & Pimentel, A. M. (2021). Educational inclusion for visually impaired persons in the higher education. Cadernos Brasileiros de Terapia Ocupacional, 29, e2904. https://doi.org/10.1590/2526-8910.ctoAR219

Tom, S.L., Mpekoa, N. & Swart, J. (2018). Factors that affect the provision of visually impaired lea rners in higher education. Conference on Information Communications Technology and Society (ICTAS), Durban, South Africa, 2018, pp. 1-5, doi: 10.1109/ICTAS.2018.8368741.

United Nations Convention on the Rights of Persons with Disabilities (2020). Convention on the Rights of Persons with Disabilities and Optional Protocol. Retrievedfrom https://www.un.org/disabilities/documents/convention/convoptprot-e.pdf

United Nations Standard Rules on the Equalization of Opportunities (2022). Standard Rules on the Equalization of Opportunities for Persons with Disabilities. Retrieved from https://www.ohchr.org/

University of Nairobi (2023). *Disability Liaison Services*. Retrieved from https://studentlife.uonbi.ac.ke/student-services/disability-liaison-services

Waddell, C.D. (2020). A Step-by-Step Guide to Complete a Dissertation: Using a Quantitative Research Methodology. London: SAGE Publications.

Wandera, R. O. & Kibanja, G.M. & Mugagga, A.M. (2019). Impaired Students at Makerere and Kyambogo Universities. Makerere Journal of Higher Education, 1, 75 – 86.

Wang, J. & Zhang, L. (2023). Artificial intelligence for visually impaired. Displays, 77(1), 102391.

Watitwa, I. C. (2015). Evaluation of Factors Influencing the Visually– Impaired Students' Learning of Social Studies: A Case of Selected Teacher Training Colleges in Kenya. Retrieved from http://ir.mu.ac.ke:8080

Were, C. (2021). Technology Training and Empowerment for the Visually Impaired: Kenya Perspective. Advances in Social Sciences Research Journal, 7, 736-744.

World Health Organization (2022). WHO releases new global estimates on visual impairment. Retrieved from https://www.emro.who.int/

APPENDICES

APPENDIX I: CONSENT FORM

FACTORS INFLUENCING ACCESS TO TECHNOLOGY EDUCATION PROGRAMS FOR THE VISUALLY IMPAIRED IN INSTITUTIONS OF HIGHER LEARNING IN KENYA

Principal Investigator: Susan Gathu, graduate student pursuing a Master of Business Administration at Strathmore University.

Introduction

You are invited to participate in a research study that aims to investigate the factors influencing access to technology education programs for visually impaired individuals in institutions of higher learning in Kenya. The study will involve visually impaired individuals, staff in the School of Computing and Informatics, and staff working in the Disability Resource Centre at the University of Nairobi.

The purpose of this study is to understand the challenges and opportunities related to technology education programs for visually impaired individuals and to gather insights from both students and staff.

Procedures:

If you agree to participate, you will be asked to share your experiences and perspectives on the factors influencing access to technology education programs. Your participation will be voluntary, and you may choose to withdraw at any time without facing any consequences or penalties.

Confidentiality

All information collected during this study will be kept confidential. Your name and any identifying information will not be disclosed in any reports or publications resulting from this research. Data will be securely stored and kept strictly confidential.

Risks and Benefits

There are minimal risks associated with participating in this study. By sharing your experiences, you will contribute valuable insights that can enhance our understanding of the challenges faced by visually impaired individuals in accessing technology education programs.

Voluntary Participation

Your participation in this study is entirely voluntary. You may choose not to participate, and you can withdraw at any time without penalty. Your decision will not affect your relationship with the University of Nairobi or any affiliated institution.

Contact Information: If you have any questions about the study or your participation, please feel free to contact: **Susan Gathu** | susan.gathu@strathmore.edu | +254 713 096666

Consent: I have read and understood the information provided above. I voluntarily agree to participate in the study on "Factors Influencing Access to Technology Education Programs for the Visually Impaired in Institutions of Higher Learning in Kenya."

Participant's Name (Print): _____

Participant's Signature: _____

Date: _____

APPENDIX II: LETTER TO THE RESPONDENTS

Susan Gathu
Strathmore University
22nd November 2023

Dear Participant,

Subject: Invitation to Participate in a Research Study

My name is Susan Gathu, and I am a student at Strathmore University pursuing Master of Business Administration. I am currently undertaking a research study on the factors influencing access to technology education programs for the visually impaired in institutions of higher learning in Kenya.

The purpose of this research is to gain a comprehensive understanding of the challenges and opportunities that visually impaired students face in accessing technology education programs, with a specific focus on the higher education landscape in Kenya. Your valuable insights and experiences can significantly contribute to the success of this study.

I appreciate your time and consideration in advance. Your contribution to this research is invaluable, and I look forward to the potential positive impact it may have on promoting inclusivity in technology education.

Thank you for your support.

Sincerely,

Susan Gathu

APPENDIX III: RESEARCH PERMIT

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **795724**

Date of Issue: **06/March/2024**

RESEARCH LICENSE

This is to Certify that Ms.. Susan Gathu of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Factors Influencing Access to Technology Education Programs for the Visually Impaired in Institutions of Higher Learning in Kenya for the period ending : 06/March/2025.

License No: **NACOSTI/P/24/33555**

795724

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

APPENDIX IV: ETHICAL APPROVAL LETTER

Ole Sangale Rd, Madaraka Estate
P. O Box 59857 - 00200, Nairobi, Kenya.
Cell: +254 703 034 d1d/6/7, Twitter: @SBSKenya
Facebook/Linkedin: Strathmore Business School

Email: info@sbs.ac.ke or visit www.sbs.strathmore.edu

Strathmore UNIVERSITY BUSINESS SCHOOL

Friday, 1st March 2024.

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – SUSAN NYAMBURA GATHU.

This is to introduce Susan Nyambura Gathu, a Master of Business Administration student at Strathmore University Business School, admission number MBA\64364\22.

As part of our MBA Program, Susan is expected to do applied research and undertake a project. This partially fulfills the requirements of the MBA course; to this effect, She would like to request appropriate data from your organization.

Susan is undertaking a research paper on "**Factors Influencing Access to Technology Education Programs for the Visually Impaired in Institutions of Higher Learning in Kenya**." The information obtained shall be treated confidentially and used for academic purposes only.

Our MBA Program seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to the industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and practical value to your organization.

We appreciate your support and will be willing to provide further information if required.

Yours sincerely,

Alois Njenga.
Manager – Graduate Programs.

APPENDIX VI: QUESTIONNAIRE

This questionnaire will be used to collect data from the visually impaired on factors that influence access to technology education programs for individuals with visual impairment in Kenyan institutions of higher learning. Please answer the following questions to the best of your ability. If you encounter any difficulties, feel free to seek assistance.

Instructions

1. Please do not write your name on the questionnaire.
2. Please respond to all questions in the spaces provided.
3. Be as honest and accurate as possible.
4. Your responses will be treated with the highest confidentiality and will only be used for the purpose of the study.

Section 1: Demographic Information

Tick [✓] appropriately

1. **What is your gender?**

   Male [ ] Female [ ]

2. **What is your age bracket?**

   Under 18 [ ] 18-24 [ ]

   25-34 [ ] 35-44 [ ]

   45-54 [ ] 55-64 [ ]

   65 or older [ ]

3. **Are you visually impaired?**

   Yes [ ]

   No [ ]

4. **What is your student status?**

   Currently a student [ ]

   Past student (graduated in the last 5 years) [ ]

5. **What is your highest education level?**

Basic Level (Primary or High School Graduate) [ ]

Certificate or Diploma Holder [ ]

Bachelor or Undergraduate Level [ ]

Postgraduate [ ]

6. What course did you take/ are you taking?

Technology Program [ ]

Non-Technology Programs [ ]

Section 2: Availability of Trained Staff

This section seeks to obtain information on availability of trained staff. Please indicate the extent to which you agree with the following statements. Kindly use the key provided below to TICK [✓] as appropriate.

Key: | 1-Strongly Disagree | 2-Disagree | 3-Neutral | 4-Agree | 5-Strongly Agree

	Statements	**1**	**2**	**3**	**4**	**5**
Number of trained staff						
1	There are an adequate number of trained staff members to support visually impaired students in my institution.					
2	The ratio of trained staff to visually impaired students is appropriate to ensure effective support.					
3	Insufficient numbers of trained staff pose a significant barrier to the success of visually impaired students.					
Qualification of teachers						
4	Teachers in technology education program are knowledgeable about the specific needs of visually impaired students.					
5	Staff members are comfortable interacting with visually impaired students and providing them with assistance.					

6	Teachers in technology education program are able to effectively adapt teaching methods and materials to meet the needs of visually impaired students.					
Training of staff to support visually impaired						
7	Staff members in my institution are adequately trained to assist visually impaired students.					
8	Staff members are trained in Braille and other assistive technologies that are relevant to the needs of visually impaired students.					
9	The training provided to staff members is effective in enhancing their ability to support visually impaired students.					

2. How does the availability of trained staff influence the access to Technology Education Programs among the visually impaired in institutions of higher learning in Kenya?

   …….

   …….

   …….

Section 3: Institutional infrastructure

This section seeks to obtain information on institutional infrastructure. Please indicate the extent to which you agree with the following statements. Kindly use the key provided below to TICK [✓] as appropriate.

Key: | **1-Strongly Disagree** | **2-Disagree** | **3-Neutral** | **4-Agree** | **5-Strongly Agree**

	Statements	**1**	**2**	**3**	**4**	**5**
Architectural design of facilities						
1	The architectural design of my institution's facilities is accessible to visually impaired students.					
2	Buildings and pathways are free of obstacles and hazards that could pose a danger to visually impaired students.					
3	Tactile surfaces and signage are provided to assist visually impaired students in navigating the premises.					
4	Doors and entrances are designed to be easily accessible to visually impaired students.					
5	Restrooms and other common areas are designed to accommodate the needs of visually impaired students.					
Accessible Classrooms and Laboratories						
6	Classrooms and laboratories in my institution are designed to be accessible to visually impaired students.					
7	Furniture and equipment are arranged in a way that allows for easy movement and access by visually impaired students.					
8	Lighting is adequate and glare-free to accommodate the needs of visually impaired students.					
Accessible library Services						
9	Library services in my institution are accessible to visually impaired students.					
10	Library materials are available in accessible formats, such as Braille, audio, and large print.					

11	Library staff is trained to assist visually impaired students with their needs.					

3. How does physical infrastructure influence the accessibility of Technology Education Programs among the visually impaired in institutions of higher learning in Kenya?

   …….

   …….

   …….

Section 4: Availability of teaching and learning materials

This section seeks to obtain information on availability of teaching and learning materials. Please indicate the extent to which you agree with the following statements. Kindly use the key provided below to TICK [✓] as appropriate.

Key: | **1-Strongly Disagree** | **2-Disagree** | **3-Neutral** | **4-Agree** | **5-Strongly Agree**

	Statements	**1**	**2**	**3**	**4**	**5**
Teaching methods						
1	Instructors in my institution use accessible teaching methods and materials for visually impaired students.					
2	Instructors provide clear and concise explanations of concepts and procedures.					
3	Instructors supplement visual materials with verbal descriptions and tactile aids.					
4	Instructors offer alternative formats for assignments and assessments that accommodate the needs of visually impaired students.					
Availability of instructional materials						
5	Instructional materials in my institution's technology education programs are available in accessible formats for visually impaired students.					
6	Course textbooks and handouts are provided in Braille, audio, and large print formats.					
7	Visual materials, such as diagrams, images, and charts, are accompanied by clear and concise verbal descriptions.					
Accessible physical and digital content						
8	Physical and digital content is accessible to visually impaired students.					

9	Course materials, such as textbooks, handouts, and presentations, are available in alternative formats, such as Braille, audio, and large print.					
10	Visual content, such as images, diagrams, and charts, is accompanied by clear and concise verbal descriptions.					

4. How does the availability of teaching and learning materials influence the accessibility of Technology Education Programs among the visually impaired in institutions of higher learning in Kenya?

   …….

   …….

   …….

Section 5: Assistive technologies

This section seeks to obtain information on assistive technologies. Please indicate the extent to which you agree with the following statements. Kindly use the key provided below to TICK [✓] as appropriate.

Key: | **1-Strongly Disagree** | **2-Disagree** | **3-Neutral** | **4-Agree** | **5-Strongly Agree**

	Statements	**1**	**2**	**3**	**4**	**5**
Technical assistance						
1	Visually impaired students in our institution have access to timely and effective technical assistance					
2	Technical support staff is knowledgeable about assistive technologies and the needs of visually impaired students.					
3	Technical support staff is proactive in identifying and addressing the technical needs of visually impaired students.					
Number of assistive technology tools						
4	There is a sufficient number and variety of assistive technology tools available to visually impaired students in our institution.					
5	The institution provides adequate funding for the purchase and maintenance of assistive technology tools.					
6	Visually impaired students have access to the assistive technology tools they need to succeed in their technology education programs.					
ICT infrastructure						
7	The ICT infrastructure in my institution is accessible and inclusive for visually impaired students.					
8	Computer workstations, software, and online resources are compatible with assistive technologies such as screen readers and Braille devices.					
9	Regular maintenance and updates are performed to ensure the ICT infrastructure remains accessible to visually impaired students.					

5. How does the availability of assistive technology influence the accessibility of Technology Education Programs among the visually impaired in institutions of higher learning in Kenya?

……

……

Section 6: Accessibility of Technology Education Programs among the visually impaired

6. This section seeks to obtain information on accessibility of technology education programs among the visually impaired. Please indicate the extent to which you agree with the following statements. Kindly use the key provided below to TICK [✓] as appropriate.

Key: | **1-Strongly Disagree** | **2-Disagree** | **3-Neutral** | **4-Agree** | **5-Strongly Agree**

	Statements	**1**	**2**	**3**	**4**	**5**
Number of Visually impaired in Technology Education Programs						
1	The number of visually impaired individuals enrolled in technology education programs has been increasing in the last five years					
2	Visually impaired students face barriers that limit their enrollment in technology education programs.					
3	Efforts to increase the number of visually impaired individuals in technology education programs are minimal					
Number of programs accessible to visually impaired						
4	The availability of technology education programs accessible to visually impaired individuals is limited.					
5	Technology education programs should prioritize accessibility for visually impaired individuals in their design and implementation.					
6	The number of programs accessible to visually impaired students has increased over time, but there is still room for improvement.					

Past students in the program						
7	Past visually impaired students in technology education programs have successfully transitioned into careers in STEM fields.					
8	The experiences of past visually impaired students in technology education programs serve as positive examples for current students.					
9	The success stories of past visually impaired students in technology education programs inspire confidence and motivation among current students.					

Thank you in advance for your time and cooperation in completing the questionnaire

APPENDIX IV: KEY INFORMANT INTERVIEW GUIDE

Introduction:

i. Thank the interviewee for their participation.
ii. Provide a brief overview of the study's objectives.

Availability of trained staff

i. How does the training of staff in the School of Computing and Informatics contribute to the accessibility of technology education for visually impaired students?
ii. In your experience, how have staff members been prepared to support the unique needs of visually impaired students in technology education?
iii. Could you share any initiatives or programs aimed at enhancing the skills of staff members in addressing the needs of visually impaired students in technology education?

Physical infrastructure

i. How is the physical infrastructure within the School of Computing and Informatics designed to cater to the accessibility needs of visually impaired students?
ii. Are there any specific modifications or features in place to enhance the physical accessibility of technology education spaces for visually impaired students?
iii. What challenges, if any, have been identified in the current physical infrastructure regarding accessibility for visually impaired students?
iv. In your opinion, what improvements or modifications could enhance the physical accessibility of technology education programs?

Availability of teaching and learning materials

i. How does the availability of teaching and learning materials impact the overall accessibility of technology education for visually impaired students?
ii. Are there any specialized materials or formats provided to accommodate the needs of visually impaired students?
iii. How are teaching materials adapted or alternatives provided to ensure that visually impaired students have equal accessible educational content in technology programs?

Availability of assistive technology

i. Can you describe the availability of assistive technology within the School of Computing and Informatics to support visually impaired students?

ii. How does the integration of assistive technology contribute to the accessibility of technology education programs?

iii. Are there training programs for both staff and visually impaired students regarding the effective use of assistive technology in the learning environment?

Accessibility of Technology Education Programs among the visually impaired

i. How many visually impaired students are enrolled in Technology Education Programs?
ii. How many technology education programs are accessible to visually impaired?
iii. How many visually impaired students have done technology education programs?

Conclusion:

i. Thank the interviewee for their participation.
ii. Let them know what the next steps are (analysis and consolidating into the report).
iii. Let them know how contact details for any questions or further information (share email and phone number).

End of interview.