



**EXPLORING THE ROLE OF ASSISTIVE  
TECHNOLOGY IN ENHANCING LEARNING FOR LEARNERS  
WITH VISUAL IMPAIRMENT IN SELECTED PRIMARY  
SCHOOLS IN LUSAKA DISTRICT, ZAMBIA**

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**Abstract:**

This qualitative study explored the role of Assistive Technology in enhancing learning for learners with visual impairment in selected primary schools in Lusaka, Zambia. The study was guided by four objectives: to explore the nature of Assistive Technology available; to establish its role in facilitating access to the curriculum and shaping academic and social experiences; to identify challenges encountered in its utilization; and to explore support systems and interventions required for sustainable integration. The research utilised a phenomenological approach, with a sample of 20 participants, including 12 visually impaired children and 8 teachers from four primary schools. Data were gathered using semi-structured interviews, focus group discussions, and observational checklists. Thematic analysis was employed to examine the data. Research indicated that the accessible Assistive Technology comprised low-tech equipment, such as braille materials, slate and pen, as well as high-tech devices like JAWS and NVDA software, albeit in limited quantities. The research indicated that Assistive Technology significantly enhanced curricular access, promoted academic engagement, and facilitated social inclusion for learners with visual impairments. Nevertheless, other obstacles impeded efficient utilisation, such as insufficient equipment, absence of teacher training, technological malfunctions, and restricted electrical supply. The research additionally identified support mechanisms, including governmental finance, educator professional development, maintenance services, and stakeholder collaborations, as essential for sustained integration. The study determined that although Assistive Technology can

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improve learning for those with visual impairments, its successful application is obstructed by systemic obstacles. Recommendations encompassed augmented governmental financing for assistive technology acquisition, the installation of educator training initiatives, and the development of maintenance and repair frameworks.

**Keywords:** assistive technology, visual impairment, learners with visual impairment, inclusive education, low-tech assistive technology, high-tech assistive technology, job access with speech (JAWS), non-visual desktop access (NVDA), sustainable integration

## 1. Introduction

Education is a vital human right for every child, regardless of their physical or cognitive limitations. The worldwide shift towards inclusive education has significantly accelerated in recent decades, propelled by international frameworks that underscore the entitlement of all learners to obtain quality education in mainstream environments. The Salamanca Statement (UNESCO, 1994) and the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD, 2006) are key international accords that have influenced global educational practices. Article 24 of the UNCRPD explicitly requires that States Parties provide necessary support to individuals with disabilities within the general education system to promote their effective education. Oliver (1990) asserts that disability is not solely an individual constraint but is constructed by society's obstacles that do not address varied requirements. This viewpoint contends that society must eliminate these obstacles instead of expecting individuals to surmount them autonomously.

In the African setting, advancements in inclusive education have been inconsistent, with numerous countries encountering substantial obstacles in executing policies that sufficiently assist learners with impairments. The World Health Organization (WHO, 2022) reports that almost 2.2 billion individuals worldwide experience vision impairment or blindness, a considerable number of whom are school-aged children. The WHO contends that most of these persons reside in low and middle-income countries, where access to supportive services is constrained. Research from multiple African nations has shown the ongoing obstacles encountered by students with vision impairments. Bahati (2023) conducted a study in elementary schools in Kasulu District, Tanzania, revealing that although some assistive technologies were available, they were predominantly inadequate to fulfil student requirements. Juma and Ntulo (2024) investigated the accessibility and utilisation of assistive technologies for students with visual impairments in Zanzibar, revealing substantial deficiencies in provision, training, and infrastructure. These studies jointly demonstrate that, notwithstanding official pledges, learners with visual impairments throughout Africa persistently encounter significant obstacles to adequate education.

The Zambian government has shown dedication to inclusive education via multiple policy frameworks and legal mechanisms. The Constitution of Zambia (Amendment) Act No. 2 of 2016 ensures the rights of individuals with disabilities, encompassing the right to education. The Persons with Disabilities Act No. 6 of 2012 mandates the advancement of equal opportunities for individuals with disabilities and their societal inclusion. The Ministry of Education's Educating Our Future (1996) policy and the National Policy on Education (2022) underscore the necessity of ensuring fair educational opportunities for all students, including individuals with special educational needs. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025b) investigated the enhancement of accessibility to inclusive education for students with disabilities in elementary schools within Ndola District, Zambia. These scholars discovered that although policies are in place, execution is a considerable challenge. Kandimba, Mandyata, and Simalalo (2023) examined teachers' comprehension of curriculum modification for students with moderate intellectual disabilities in Zambia, revealing deficiencies in teacher training and resource accessibility. These studies underscore that the disparity between policy and practice in Zambian inclusive education still exists significantly.

Assistive Technology (AT) has become an essential instrument in reconciling the skills of learners with visual impairments and the requirements of the educational setting. Assistive Technology (AT) denotes any technology, equipment, or system that aids individuals with impairments in executing tasks that may otherwise be challenging or unfeasible. Assistive technology for individuals with visual impairments encompasses low-tech tools such as braille writers, slates and styluses, and magnification devices, as well as high-tech solutions including screen reading software like Job Access with Speech (JAWS) and Non-Visual Desktop Access (NVDA), refreshable braille displays, and optical character recognition systems. Valipoor, Antonio Jiménez, and Cabrera Quesada (2024) contend that the efficacy of these technologies is largely contingent upon user-centred design and suitable implementation tactics. They assert that technologies created without a thorough assessment of user needs frequently do not satisfy the genuine requirements of individuals with visual impairments. Kaulu (2019) conducted a study at the Zambia Library, Cultural and Skills Centre for the Visually Impaired in Lusaka, demonstrating that assistive technologies such as JAWS and NVDA facilitated access to academic materials for learners with visual impairments, allowing them to perform comparably to their sighted counterparts when utilised consistently. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025a) assert in their examination of pedagogical strategies for students with intellectual disabilities that the accessibility of suitable resources and teacher proficiency are essential factors influencing successful inclusive education outcomes. Bwalya, Nambula, Kandimba, Kalima, Mubisi, and Mwalungali (2026) underscore, in their assessment of instructional mediums for students with hearing impairments, that the congruence between learner requirements and educational resources is crucial for substantive access. This study aimed to investigate

the role of Assistive Technology in improving educational outcomes for learners with visual impairment in selected primary schools in Lusaka, Zambia.

## **2. Statement of the Problem**

The ideal situation, as reflected in Zambian policies and international frameworks like the UNCRPD (2006), envisions learners with visual impairments having equal access to quality education through suitable AT. In this scenario, they would receive timely access to braille writers, screen readers, magnification devices, and other tools, enabling full participation, equitable curriculum access, and academic success. Teachers would receive comprehensive AT training, maintenance systems would ensure functionality, and policies would be adequately resourced.

However, actual conditions in Zambian primary schools starkly diverge. Learners face substantial obstacles due to insufficient AT, while existing devices are underutilised because of inadequate teacher training, frequent malfunctions, low teacher awareness, and infrastructural issues like unreliable electricity and internet. Many schools lack appropriate AT or rely on obsolete equipment. Educators often lack the skills to teach students how to use available technology, and maintenance systems are either absent or ineffective.

The consequences of this disparity between policy and practice are significant. These may include lower academic achievement, limited classroom engagement, social isolation, and diminished long-term prospects. Without suitable AT, learners cannot read printed materials, complete written tasks independently, or engage in technology-driven learning, perpetuating educational inequity and violating their right to quality education. Although research on AT for learners with visual impairments exists in other African contexts (Bahati, 2023; Juma & Ntulo, 2024) and at Zambian specialised institutions (Kaulu, 2019), a gap remains regarding mainstream primary schools in Lusaka. The experiences of these learners using available technology have not been systematically documented. This study was prompted by the need to investigate the nature of available AT, its role in facilitating learning, challenges encountered, and necessary support systems for sustainable AT integration in selected Lusaka primary schools.

## **3. Research Objectives**

The study was guided by the following objectives:

- 1) To explore the nature of Assistive Technology available for learners with visual impairment in selected primary schools in Lusaka.
- 2) To establish the role of Assistive Technology in facilitating access to the curriculum and shaping the academic and social experiences of learners with visual impairment in selected primary schools in Lusaka.

- 3) To identify the challenges encountered by teachers and learners with visual impairment in the effective utilization of Assistive Technology in selected primary schools in Lusaka.
- 4) To explore the support systems and interventions required to enhance the sustainable integration of Assistive Technology for learners with visual impairment in selected primary schools in Lusaka.

#### **4. Theoretical Framework**

This research is informed by two complementary theories: the Social Model of Disability and Vygotsky's Social Constructivist Theory. The Social Model of Disability, formulated by disabled activists and researchers such as Mike Oliver in the 1980s, differentiates between impairment (individual limitation) and disability (societal obstacles). This approach posits that individuals are disabled by societal barriers such as attitudinal, architectural, and systemic barriers rather than solely by their impairments. Oliver (1990) contends that disability arises from the interaction between individuals with disabilities and an environment that inadequately meets their needs. He asserts that society bears the obligation to eliminate these obstacles instead of expecting individuals to surmount them. This study utilises the Social Model of Disability to elucidate how the absence of suitable Assistive Technology engenders disability among learners with visual impairments. When educational institutions neglect to offer assistive technology, when educators are not trained in its utilisation, and when curricula are not crafted with accessibility considerations, students with visual impairments are hindered by these systemic obstacles. Conversely, when suitable assistive technology is supplied and properly employed, the environment becomes more accessible, diminishing handicap and facilitating participation.

Vygotsky's Social Constructivist Theory underscores the significance of social interaction and cultural instruments in cognitive development. Vygotsky (1978) posits that learning transpires through engagement with more knowledgeable individuals inside the Zone of Proximal Development (ZPD), which delineates the disparity between a learner's autonomous capabilities and their potential achievements with support. He additionally contends that instruments and symbols (psychological tools) facilitate learning and development, hence enhancing higher cognitive capabilities. For those with visual impairments, Assistive Technology functions as an essential psychological instrument that facilitates their engagement with the educational setting. Screen readers facilitate access to text, braille devices enable writing, and magnification tools enhance visual information. Within the ZPD paradigm, AT is a tool that facilitates learners with visual impairments in executing tasks they cannot complete autonomously, aiming for the eventual internalisation of skills and attainment of independent functioning.

The incorporation of these two theories offers a thorough foundation for this study. The Social Model of Disability emphasises environmental obstacles and society's

obligation to eliminate these impediments by providing suitable assistive technology and support services. Vygotsky's approach emphasises the developmental processes by which assistive technology facilitates learning and social engagement. Collectively, these ideas indicate that successful integration of assistive technology necessitates the elimination of systemic obstacles and the deliberate application of technology as a mediating instrument in social learning environments.

## **5. Review of Literature**

The review of literature is organized thematically according to the research objectives, covering: the nature of Assistive Technology available, the role of AT in facilitating access to the curriculum, challenges in the utilization of AT, and support systems and interventions for sustainable integration. For each theme, literature is reviewed, and gaps are identified.

### **5.1 Explanation of the Main Concept**

Assistive Technology (AT) encompasses any technology, equipment, software, or system that aids individuals with impairments in executing tasks that may otherwise be challenging or unfeasible. For those with visual impairments, assistive technology includes several tools aimed at enhancing access to information and engagement in educational pursuits. These technologies are generally classified into low-tech, mid-tech, and high-tech solutions according to their complexity and sophistication level. Low-tech assistive technology includes non-electronic equipment, including braille writers, slates and styluses, magnifying glasses, large-print materials, tactile diagrams, and abacuses for mathematical calculations. High-tech assistive technology encompasses electronic and computer-based solutions, including screen reading software (JAWS and NVDA), refreshable braille displays, optical character recognition systems, and digital magnifiers.

### **5.2 Nature of Assistive Technology Available for Learners with Visual Impairment**

The accessibility of assistive technology for individuals with visual impairments differs markedly between industrialised and developing nations. Valipoor, Antonio Jiménez, and Cabrera Quesada (2024) contend that comprehending the continuum of assistive technology is crucial for aligning suitable solutions with the specific needs of individual learners. They contend that technologies created without a thorough assessment of user needs frequently do not satisfy the genuine requirements of individuals with visual impairments. In wealthy nations, individuals with visual impairments frequently benefit from an extensive array of both low-tech and high-tech solutions, bolstered by robust service delivery networks.

Research in Africa has identified substantial obstacles in the provision of assistive technology. Bahati (2023) indicates that educational institutions in Kasulu District, Tanzania, possessed few technological assistive tools. He argues that these measures

were inadequate to accommodate all learners with visual impairments. He additionally observes that the resilience of low-tech equipment renders them advantageous in situations lacking maintenance services. Nonetheless, he notes that low-tech solutions possess constraints, such as reduced production speed and the cumbersome nature of materials. Juma and Ntulo (2024) noted that primary schools in Zanzibar had access to certain assistive technologies, including braille and speech recognition software. They experts assert that they were frequently insufficient in both number and quality. They contend that the absence of standardised provision norms leads to considerable discrepancies among schools.

In Zambia, data about the accessibility of assistive technology in elementary schools is scarce. Kaulu (2019) discovered that at the Zambia Library, Cultural and Skills Centre for the Visually Impaired in Lusaka, JAWS and NVDA were the predominant assistive technology. He claims that these facilitated access to e-books, PDF documents, websites, and numerous apps for learners with visual impairments. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025b) observe that resource limitations in elementary schools within Ndola District substantially affect the accessibility of specialised equipment for students with impairments. Bwalya, Nambula, Kandimba, Kalima, Mubisi, and Mwalungali (2026) similarly note that educational institutions frequently lack the essential infrastructure required to accommodate learners with special needs.

### **5.3 Role of Assistive Technology in Facilitating Access to the Curriculum**

Research worldwide has shown that assistive technology is essential for enabling curriculum access for students with visual impairments. Vygotsky (1978) contends that tools facilitate learning and empower learners to operate within their Zone of Proximal Development. He contends that this renders AT indispensable for cognitive growth. Screen reading software like JAWS and NVDA facilitates access to digital content, including e-books, online resources, and instructional software, for learners with visual impairments.

Research in Africa has validated the beneficial impact of assistive technology on educational access. Bahati (2023) investigated the utilisation of ATs to enhance teaching and learning in Tanzania. He discovered that, although constrained, educators and students were utilising the existing assistive technology in various ways. He further contends that the educational outcomes of learners with visual impairments were, to a certain degree, improved. Bahati asserts that the regular application of assistive technology, alongside suitable pedagogical methods, enhances educational results. Juma and Ntulo (2024) discovered that assistive technology facilitated greater participation of learners with visual impairments in classroom activities. They additionally claim that assistive technology diminished their reliance on sighted peers for reading and writing activities.

Kaulu (2019) illustrates that assistive technology enabled visually impaired learners at ZLCSCVI in Zambia to access valuable library information resources, including e-books, PDF documents, websites, and social media platforms for communication and education. His research indicates that when effectively and regularly utilised as a complement to conventional instruction, assistive technology enables learners with visual impairments to achieve performance levels comparable to their sighted counterparts. Kaulu (2019) asserts that technology functions as a significant equaliser in educational environments. Kandimha, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025a) contend that effective inclusive education necessitates appropriate pedagogical strategies coupled with adequate resources.

#### **5.4 Challenges Faced in the Implementation of Assistive Technology**

Worldwide, several obstacles impede the efficient use of assistive technology, despite its acknowledged advantages. Valipoor *et al.* (2024) emphasise that the absence of a user-centred approach in technology development frequently leads to solutions that are challenging for educators and students with visual impairments to utilise effectively. They assert that technology makers must address the training requirements of both educators and students.

In Africa, difficulties are especially pronounced. Juma and Ntulo (2024) describe a deficiency of devices, inadequate training for both educators and students, adverse perceptions about Assistive Technology, and a scarcity of competent teachers as significant impediments in elementary schools in Zanzibar. Bahati (2023) discovered that numerous ATs were unavailable. He further contends that the available resources were inadequate to accommodate learners with vision impairments. Bahati further observes that several accessible ATs were non-operational due to malfunctions and insufficient maintenance, underscoring sustainability concerns. Infrastructure obstacles, such as inconsistent electrical supply and inadequate internet access, hinder the utilisation of assistive technology.

In Zambia, Kaulu (2019) underscores the need of training, asserting that educators' pedagogical approaches must incorporate appropriate assistive technologies to enable visually impaired learners to perform comparably to their sighted counterparts. He advocates for thorough assistive technology training for all educators of students with visual impairments. Kandimba, Mandyata, and Simalalo (2023) discovered that educators frequently lack sufficient preparation for instructing students with disabilities, particularly in the utilisation of assistive technologies. Bwalya *et al.* (2026) observe that resource constraints, such as inadequate teaching and learning resources, severely hinder educational opportunities for students with special needs in Zambian schools.

#### **5.5 Support Mechanisms and Strategies for Sustainable Integration**

Internationally, studies indicate that overcoming obstacles in assistive technology use necessitates extensive support networks. Juma and Ntulo (2024) assert that multi-level

interventions are crucial for achieving enduring transformation. They contend that they encompass governmental financing, educator training, maintenance frameworks, and stakeholder collaborations.

Researchers in Africa have suggested numerous strategies. Bahati (2023) advocates for appropriate budget allocation to facilitate the procurement and maintenance of assistive technology for primary schools. He moreover advocates for the enhancement of pre-service and in-service teacher training programs to furnish educators with essential competencies. Juma and Ntulo (2024) advocate for governments to devote significant resources to the acquisition and upkeep of assistive devices. They advocate for the creation of support systems and resource centers to improve effective utilisation.

Kaulu (2019) advises the Zambian government to acquire assistive technology, specifically JAWS, for educational institutions catering to visually impaired students. He additionally advocates for all educators of visually impaired students to receive training in the utilisation of JAWS. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025b) contend that enhancing access to inclusive education necessitates collaborative initiatives from government, educational institutions, teacher training programs, and communities. They assert that policy frameworks must be supported by sufficient resources and execution methodologies.

## 5.6 Gaps in the Literature

Although current literature offers important insights into the availability, role, challenges, and support systems of assistive technology in diverse contexts, notable gaps persist concerning the primary school context in Zambia. Research has been undertaken at specialised institutions in Zambia (Kaulu, 2019) and in many other African nations (Bahati, 2023; Juma & Ntulo, 2024). Nonetheless, there exists a paucity of research explicitly targeting mainstream elementary schools in Lusaka. The distinctive contextual elements influencing assistive technology availability and usage in Zambian urban primary schools, such as resource restrictions, policy execution deficiencies, teacher training, and infrastructural constraints, are inadequately examined. Moreover, the lived experiences of students with visual impairments in these institutions and their perceptions of how assistive technology influences their academic and social lives have not been sufficiently recorded. This study aims to address these deficiencies by examining the nature, role, problems, and support systems associated with assistive technology in selected primary schools in Lusaka.

## 6. Methodology

This study employed a qualitative research methodology utilising a phenomenological design. A qualitative technique was suitable as the study aimed to investigate the experiences, perceptions, and significances that learners with visual impairments and their educators associate with the utilisation of Assistive Technology. The

phenomenological design was selected to comprehend the essence of the lived experiences of persons who share a common phenomenon, notably the utilisation of assistive technology in learning.

The research was carried out in Lusaka District, Zambia, where four primary schools were purposefully chosen based on the enrolment of students with visual impairments, the availability of some Assistive Technology, the willingness of the school administration to engage, and the accessibility for the researcher.

The sample included 20 participants, consisting of 12 learners with visual impairment and 8 teachers from four designated elementary schools. Purposive sampling was employed to choose schools and participants. Learners with visual impairment were chosen based on their enrolment in grades 3-7, identification as learners with visual impairment, prior exposure to assistive technology, and willingness to participate with parental approval. Teachers were chosen based on their accountability for instructing students with visual impairments, proficiency with assistive technology, and readiness to engage.

Three study instruments were employed: semi-structured interview guides for learners with visual impairment and teachers, together with an observation checklist. Data were gathered through individual interviews, focus group talks, and observations. The data analysis employed the thematic analysis method as delineated by Braun and Clarke (2006), comprising six phases: familiarisation, initial code generation, theme identification, theme review, theme definition and nomenclature, and findings documentation. Trustworthiness was established through triangulation, member checking, comprehensive description, and reflexivity. Ethical standards such as informed consent, confidentiality, voluntary engagement, and respect for individuals were rigorously upheld.

## **7. Presentation of Findings**

The presentation of the findings of the study is based on data collected from learners with visual impairment and teachers in four selected primary schools in Lusaka. The findings are organized according to the four research objectives. Direct verbatim quotes from participants are included to illustrate the themes that emerged from the data. Pseudonyms are used to protect the identity of participants.

### **7.1 Findings on the Nature of Assistive Technology Available**

The study found that selected primary schools in Lusaka had a mix of low-tech and high-tech Assistive Technology, though availability was generally limited and varied across schools.

- **Theme 1: Low-Tech Assistive Technology**

All four schools had some low-tech AT devices. The most commonly available were braille writers, slate and stylus, braille paper, magnifying devices, and tactile materials. One teacher explained:

*"We have two Perkins brailers in this school, but we have seven learners with visual impairment who need to use them. So, they have to share, and sometimes they don't get enough practice time."* (Teacher 2, School A)

A learner with visual impairment described:

*"I use the slate and stylus for taking notes in class. It is slower than the Perkins, but it is what we have. Sometimes the slate is broken, and I have to wait for it to be fixed."* (Learner 3, School B)

- **Theme 2: High-Tech Assistive Technology**

High-tech AT was less common and concentrated in two of the four schools. Two schools had computers installed with JAWS and NVDA screen-reading software, though the number of computers was limited (one or two per school), and not all were functional. Audio players and recorders were available in three schools. A learner with visual impairment shared:

*"I like using the computer with JAWS because I can hear what is on the screen. I can read stories and even go on the internet when it is working. But there are many of us who want to use it, so I only get a turn once or twice a week."* (Learner 6, School B)

- **Theme 3: Functionality Issues**

Observations revealed that some AT devices were not in functional condition. At one school, a Perkins braille was broken and had been awaiting repair for several months. A teacher from school C noted that:

*"This braille has been broken since last term. We reported to the district, but no one has come to fix it. So, learners with visual impairment just have to manage with what works."* (Teacher 4, School C)

## 7.2 Findings on the Role of Assistive Technology

The study found that AT played multiple positive roles in enhancing educational experiences for learners with visual impairment.

- **Theme 4: Access to Reading and Learning Materials**

Participants consistently reported that AT enabled learners with visual impairment to access materials that would otherwise be inaccessible. One teacher from school A stated that:

*"Before I got the braille books, I couldn't read like my friends. Now I can read my textbooks and answer questions. The computer with JAWS also helps me to read things that are not in braille."* (Learner 4, School B)

A teacher noted:

*"With the screen reader, learners with visual impairment can access information from the internet. This opens up a whole world of knowledge that was previously closed to them."* (Teacher 2, School A)

- **Theme 5: Participation in Classroom Activities**

AT was reported to enhance the ability of learners with visual impairment to participate actively. One teacher from school D stated that:

*"When we have group discussions, I use my braille notetaker to write down points. Then I can share with my group. I feel like I am contributing"* (Learner 7, School C).

Teachers observed:

*Learners with visual impairment who use AT are more confident in answering questions and giving presentations. Those without AT tend to be quieter."* (Teacher 6, School D)

- **Theme 6: Development of Independence and Confidence**

Both teachers and learners with visual impairment highlighted how AT promoted independence. One teacher from school D stated that:

*"I don't have to wait for someone to read to me all the time. If I have a braille book or the computer, I can read by myself. That makes me feel good."* (Learner 1, School A)

A teacher elaborated:

*"Independence is one of the biggest benefits. When learners with visual impairment can access materials on their own, this builds their confidence and prepares them for higher education"* (Teacher 8, School D).

- **Theme 7: Social Inclusion**

AT was found to facilitate social interaction between learners with visual impairment and sighted peers. One learner from school D stated that:

*"My friends like to listen when I use the computer with speakers. They ask me questions about how it works. Sometimes we listen to stories together."* (Learner 5, School B)

Another learner with visual impairment shared:

*"I use WhatsApp on my phone with the screen reader to chat with my friends. It makes me feel connected."* (Learner 11, School D)

### 7.3 Findings on the Challenges Encountered

Multiple challenges hindered effective AT utilization for learners with visual impairment.

- **Theme 8: Inadequate Quantity of Devices**

The most frequently mentioned challenge was an insufficient number of devices. One teacher from school C stated that:

*"We have more learners with visual impairment than devices. So, they have to share, and that means less practice time. Some learners don't get to use the technology at all on some days."* (Teacher 4, School C)

A learner with visual impairment expressed frustration:

*"I wish we had more braille writers. Sometimes I finish my work late because I have to wait for my turn."* (Learner 3, School B)

- **Theme 9: Lack of Training**

Teachers acknowledged limited training in AT. One teacher from school B stated that:

*"I was not trained on how to use JAWS during my teacher training. I learned a little bit on my own, but I am not an expert. So, when learners with visual impairment have problems, I cannot always help them."* (Teacher 5, School C)

Learners with visual impairment also reported needing more training:

*"When I first started using the computer, it was difficult. I had to learn by pressing buttons. If someone could teach me properly, I would learn faster."* (Learner 6, School B)

- **Theme 10: Technical Breakdowns and Lack of Maintenance:** One learner from school D reported that:

*"Devices break down, and then they sit there for months because there is no one to fix them. We don't have technicians who know how to repair assistive devices."* (Teacher 2, School A)

A learner with visual impairment shared:

*"My favorite audio player stopped working three weeks ago. I told my teacher, but she said we have to wait for someone to come and look at it."* (Learner 8, School D)

- **Theme 11: Infrastructure Challenges:** One teacher from school D stated that:

*"Sometimes the power goes off while a learner with visual impairment is using the computer. Then they have to stop and wait."* (Teacher 6, School D)

Internet connectivity was absent in three of the four schools.

- **Theme 12: High Costs and Negative Attitudes:**

*"Braille paper is expensive. A ream costs a lot, and it doesn't last long."* (Teacher 1, School A)

Some participants mentioned negative attitudes:

*"Some teachers don't understand why learners with visual impairment need these technologies. They think it's too much trouble."* (Teacher 4, School C)

#### **7.4 Findings on Support Systems and Interventions Required**

Participants suggested various support systems and interventions to enhance AT integration for learners with visual impairment.

- **Theme 13: Government Funding and Policy Support**

One teacher from school A highlighted that:

*"The government should provide more devices to schools. Not just a few, but enough for all learners with visual impairment who need them. This should be a priority in the education budget."* (Teacher 2, School A)

- **Theme 14: Teacher Training**

A teacher from school A stated that:

*"All teachers who work with learners with visual impairment should receive training on AT. This should be part of their pre-service training, and there should be refresher courses regularly."* (Teacher 1, School A)

Another learner with visual impairment added:

*"If teachers know how to use the technology well, they can teach us better."* (Learner 7, School C)

- **Theme 15: Maintenance Systems**

A teacher from school B unveiled that:

*"We need a system where someone can come and repair devices quickly when they break. Maybe the Ministry could have mobile technicians who visit schools regularly."* (Teacher 3, School B)

- **Theme 16: Stakeholder Partnerships**

One teacher from school D reported that:

*"We have received some devices from NGOs in the past. These partnerships are helpful. The government should work with more organizations to bring in technology and training."* (Teacher 7, School D)

- **Theme 17: Resource Centers and Awareness Creation**

Some participants proposed resource centers and emphasized awareness creation. One teacher from school C stated that:

*"People need to understand why AT is important. When parents understand, they can support their children with visual impairment better."* (Teacher 5, School C)

## 8. Discussion of Findings

The discussion of the findings was based on the research objectives, existing literature, and the theoretical framework guiding the study. The discussion is organized according to the four research objectives, with each section relating findings to literature, theory, and implications for theory and practice.

### **8.1 Discussion on the Nature of Assistive Technology Available**

The findings that assistive technology in certain primary schools in Lusaka predominantly comprises low-tech devices with few high-tech alternatives aligns with Bahati's (2023) research in Tanzania. Bahati disclosed that primary schools possessed some assistive technology, although many were unavailable and those that were there were inadequate. This discovery corresponds with the conclusions of Juma and Ntulo (2024) in Zanzibar, where educational institutions encountered analogous shortages. The prevalence of low-tech assistive technology illustrates the resource limitations typical in underdeveloped nations. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025b) acknowledge this reality in their examination of inclusive education in Ndola District, Zambia.

The restricted accessibility of advanced assistive technology and operational difficulties signify fundamental obstacles in the provision and upkeep of assistive technology. Bahati (2023) contends that a purchase devoid of maintenance planning results in resource wastage. According to the Social Model of Disability, the insufficient availability of assistive technology is an environmental barrier that engenders disability for learners with visual impairments. Vygotsky (1978) contends that the lack of these mediational tools restricts chances for learners with visual impairment to participate in mediated learning within their Zones of Proximal Development.

These findings bear significance for policy and practice. The Ministry of Education ought to perform thorough assessments of assistive technology requirements and availability, create standardised inventories of important assistive technology for each school, and implement processes for routine maintenance and replacement. Investment must equilibrate low-tech and high-tech solutions, acknowledging that both are essential for various purposes and situations.

### **8.2 Discussion on the Role of Assistive Technology**

The finding that AT played multiple positive roles, facilitating access to reading materials, enabling classroom participation, promoting independence and confidence, fostering social inclusion, and contributing to academic performance, is strongly supported by existing literature. Kaulu (2019) similarly found that AT enabled learners with visual impairment to access library information resources and perform like their sighted peers. The finding that AT promotes independence aligns with the goals of self-learning technologies documented internationally.

The social dimension of AT enabling communication with peers and use of social media emerged as particularly significant. This extends the focus beyond purely academic benefits to consider holistic development. Kaulu (2019) argues that social connection is as important as academic access for learners with visual impairment. However, the study also revealed that these benefits are contingent on consistent access to AT, suggesting that the relationship between AT and outcomes is not automatic.

From Vygotsky's (1978) perspective, AT serves as a psychological tool that mediates the interaction of learners with visual impairment with their environment. This enables them to perform within their Zone of Proximal Development. The social dimension of AT use aligns with Vygotsky's emphasis on social interaction as the source of cognitive development. The Social Model of Disability is also relevant, as AT reduces disability by removing environmental barriers.

These findings have implications for policy and practice. Schools should recognize AT not merely as an accommodation but as a fundamental tool for learning and development for learners with visual impairment. This means ensuring consistent access, integrating AT use into daily classroom routines, and fostering social environments where AT use is normalized and valued. Teachers should explicitly teach both technical skills and metacognitive strategies for learning with AT.

### **8.3 Discussion on the Challenges Encountered**

The various obstacles observed, including insufficient device availability, poor training, technical malfunctions, infrastructural constraints, elevated costs, and adverse attitudes, are strikingly consistent with those recorded in other African contexts. Juma and Ntulo (2024) recognised such impediments in Zanzibar. Bahati (2023) emphasised inadequate infrastructure and insufficient maintenance services in Tanzania. Kandimba, Mandyata, and Simalalo (2023) discovered that teachers frequently lack sufficient training to support learners with impairments in Zambia.

The deficiency in teacher training surfaced as a significant obstacle. Kaulu (2019) asserts that all teachers of learners with visual impairments necessitate extensive assistive technology training. Technical failures and insufficient maintenance pose a sustainability problem that underscores the necessity for thorough planning. Infrastructure constraints signify overarching developmental issues, while attitudinal impediments highlight the necessity for awareness enhancement.

From the Social Model perspective, these issues signify various levels of environmental obstacles: material, systemic, infrastructural, and attitudinal. Oliver (1990) contends that disability arises from the interplay between impairment and various impediments. Vygotsky (1978) contends that insufficient training diminishes the mediational capacity of assistive technology, resulting in the underutilisation of the Zone of Proximal Development for learners with visual impairments.

These findings bear significance for policy and practice. Confronting issues necessitates multifaceted interventions. Teacher training should be prioritised at both pre-service and in-service stages. Maintenance methods ought to be instituted via area technicians or collaborations with technical institutes. Enhancements to infrastructure are crucial for advanced technology applications. Awareness campaigns must focus on educators, learners with visual impairment, parents, and communities to foster comprehension and endorsement of assistive technology.

## 8.4 Discussion on Support Systems and Interventions Required

The support systems and interventions highlighted by participants, such as government funding, teacher training, maintenance systems, stakeholder partnerships, resource centres, awareness development, and curriculum integration, are well aligned with recommendations in the available literature. Juma and Ntulo (2024) advocate for governmental financial support and resource centers. Kaulu (2019) advocates for governmental acquisition of JAWS and the training of educators. Bahati (2023) advocates for enhanced teacher training and budgetary allocation.

The appeal for stakeholder collaborations is especially pertinent in resource-limited environments. Bwalya *et al.* (2026) assert that collaborations can mitigate resource constraints. The concept for resource centers is a practical solution to the difficulty of providing every school with various forms of assistive technology. The focus on teacher training in all research highlights its significance. Kandimba, Kalimaposo, Mandyata, Bwalya, Kabwe, and Kalunga (2025a) contend that teacher competence is essential for effective inclusive education.

From the Social Model perspective, the highlighted support systems exemplify the systemic changes required to eliminate environmental barriers. Vygotsky (1978) contends that teacher training guarantees that "*more knowledgeable others*" who assist learners with visual impairments in utilising assistive technology possess the requisite competence. He further asserts that curriculum integration guarantees the methodical advancement of AT skills.

These findings bear significance for policy and practice. The Ministry of Education ought to formulate a comprehensive assistive technology policy and implementation strategy that encompasses purchase, distribution, training, maintenance, and monitoring. Teacher training institutions ought to incorporate assistive technology content into their courses. Educational institutions ought to formulate Assistive Technology programs tailored to their distinct requirements, while aggressively seeking and coordinating collaborations with non-governmental organisations, the commercial sector, and local communities.

## 9. Conclusion and Recommendations

### 9.1 Conclusion

This study explored the role of AT in enhancing learning for learners with visual impairment in selected primary schools in Lusaka. The subsequent conclusions are derived from the findings. The study concludes that certain elementary schools in Lusaka possess assistive technology, predominantly low-tech equipment, with few high-tech alternatives available. The supply of assistive technology is insufficient to satisfy the requirements of all learners with visual impairment, and certain devices are inoperative due to inadequate maintenance. This circumstance restricts learners with visual impairments from accessing the complete array of tools that could enhance their learning

experience. The study indicates that AT is essential for improving curriculum access, allowing learners with visual impairments to read, write, and engage in classroom activities. Assistive technology fosters autonomy, self-assurance, and social integration, so enhancing comprehensive development. Nonetheless, these advantages are contingent upon sufficient and continuous access to operational devices. The study identifies several obstacles that impede the effective use of assistive technology for learners with visual impairments, including insufficient device availability, inadequate training for educators and students, technical malfunctions, infrastructural constraints, elevated costs, and adverse perceptions. These difficulties are interrelated and necessitate holistic solutions. In conclusion, the study asserts that improving assistive technology integration for visually impaired learners necessitates multifaceted support systems, which encompass augmented government funding, extensive teacher training, dependable maintenance services, stakeholder collaborations, resource centers, awareness initiatives, and curriculum incorporation. The study suggests that although Assistive Technology possesses considerable potential to improve learning for visually impaired students, this potential is not fully actualised in certain primary schools in Lusaka due to structural obstacles. Confronting these difficulties necessitates unwavering dedication from government, educational institutions, teachers, and communities.

## 9.2 Recommendations

Based on the findings and conclusions of this study, the following recommendations are made:

- 1) The Ministry of Education should boost budget allocation for AT procurement and establish a national policy with clear standards for provision, distribution, maintenance, and monitoring to ensure equitable access.
- 2) Teacher training institutions should integrate AT training into curricula, covering both technical operation and pedagogical integration, with regular refresher courses to keep teachers' skills updated.
- 3) The Ministry should develop repair systems by training regional technicians, partnering with technical colleges, and ensuring procurement contracts include maintenance provisions and warranties.
- 4) The Ministry should coordinate partnerships with NGOs, the private sector, and communities to provide devices, funding, training, and expertise, ensuring efficient resource use and alignment with national priorities.

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### **Conflict of Interest Statement**

The authors declare no conflicts of interest.

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