The Implementation of Visual Technological Equipment by Learners with Hearing Impairment in Primary Schools of Victoria Falls Cluster: Challenges and Solutions

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ABSTRACT

The persistent government focus on the provision of hearing aids through the Department of Schools Psychological Services has resulted in the continued use of inappropriate equipment for learners who are deaf in primary schools. This study explored the implementation of visual technological equipment by learners with hearing impairment in primary schools within the Victoria Falls cluster, with specific attention to the challenges faced and possible solutions. The study adopted a qualitative research design. The target population consisted of teachers and school heads from primary schools in the Victoria Falls Cluster of Hwange District, Matabeleland North Province, Zimbabwe. Data were collected using semi-structured interviews and open-ended questionnaires, and were analyzed thematically to identify key patterns and meanings emerging from participants' experiences. The findings revealed that the majority of teachers and school heads held positive perceptions towards the use of visual technological equipment in the teaching and learning of learners who are deaf. However, the study established that most schools relied on audio-based technological resources, which were largely irrelevant and ineffective for learners with hearing impairment. Major challenges identified included limited knowledge and expertise among teachers, misconceptions regarding appropriate instructional technologies for deaf learners, and inadequate professional training. Additionally, financial constraints significantly affected schools' capacity to procure suitable visual technological equipment such as computers, tablets, and overhead projectors. The study recommended that the Ministry of Primary and Secondary Education should prioritize the provision of appropriate visual technological resources and implement continuous professional development programs to equip teachers with relevant skills. Furthermore, it recommended that government policy should shift from an overreliance on hearing aids towards supporting schools in acquiring and effectively utilizing visual technological equipment for learners who are deaf.

Keywords: Visual Technological Equipment, Hearing aids, Sign Language, Hearing Impairment

INTRODUCTION AND BACKGROUND

Globally, education systems have increasingly embraced inclusive education to ensure equitable access to quality learning for all learners, including those with disabilities (Sharan, 2015). Despite these efforts, learners with disabilities—particularly those with hearing impairment—continue to experience marginalization within mainstream educational settings (Karasu, 2020; Kyle, 2016). Learners with hearing loss often require enhanced instructional support, concrete learning experiences, and explicit teaching strategies to fully access curriculum content (Karasu, 2020; Kyle, 2016). Consequently, visual technological equipment (VTE) plays a critical role in facilitating meaningful learning for these learners by compensating for limitations in auditory input and enhancing access to information (Moyle, 2006; Triarini, 2017).

Research consistently demonstrates that visual technologies improve comprehension, engagement, and academic achievement among learners with hearing impairment by making abstract concepts more concrete and accessible (Moyle, 2006; Triarini, 2017). The Human Rights Model of disability reinforces this perspective by advocating for equitable opportunities and inclusive practices that recognize learners' strengths rather than limitations (Ainscow, Booth, & Dyson, 2006). This model aligns with international frameworks

such as the Salamanca Statement (1994), the Incheon Declaration, the Universal Declaration of Human Rights, and disability legislation, all of which promote inclusive, asset-based educational approaches responsive to diverse learner needs (Ainscow et al., 2006).

In developed contexts such as the United States, the implementation of visual technological equipment to support learners with hearing impairment has gained considerable attention. Flexer (2017) observed that assistive technologies, including hearing loops and FM systems, significantly enhanced learning experiences for learners with hearing impairment. However, Johnson, Smith, and Brown (2018) cautioned that the effectiveness of such technologies depends heavily on adequate planning, teacher training, and institutional support—factors often insufficient. Although the Individuals with Disabilities Education Act (IDEA, 2004) provides a strong legal framework, persistent gaps between policy and classroom practice remain evident, highlighting the need for continued research into implementation challenges and practical solutions (Edyburn, 2015).

Within the African context, similar challenges are evident. In Nigeria, schools face severe infrastructural and resource constraints that limit effective implementation of visual technological equipment for learners with hearing impairment (Obiakor & Afolabi, 2017). Teachers frequently lack the necessary training and expertise to utilise these technologies effectively, further exacerbating learning barriers (Ogunleye, 2015). Nevertheless, there is growing recognition of the importance of inclusive education and the provision of appropriate support mechanisms for learners with disabilities (Eleweke, 2017).

Likewise, Botswana has made policy commitments towards inclusive education, yet practical challenges persist. Kgaphola and Tsheko (2017) noted that although inclusive education is gaining momentum, schools often lack adequate resources and specialised training required to integrate visual technological equipment effectively. Teachers require continuous professional support to meaningfully embed such technologies in instructional practices (Makalela & Kgware, 2019). Despite these challenges, Botswana's education policy underscores the importance of equitable access to education for learners with disabilities (Republic of Botswana, 2016).

In Zimbabwe, learners with hearing impairment continue to face substantial barriers in accessing quality education, particularly due to limited availability of visual technological equipment. Chireshe (2011) reported that many learners rely predominantly on traditional communication methods such as sign language because assistive and visual technologies are scarce. Although technologies such as hearing aids and FM systems can enhance learning, many schools lack the infrastructure and financial capacity to procure, maintain, and effectively utilise such equipment (Machingura, 2017). While the Zimbabwean government has introduced policies and programmes aimed at promoting inclusive education (Zimbabwe Ministry of Primary and Secondary Education, 2016), significant gaps remain in addressing the specific needs of learners with hearing impairment.

In Victoria Falls Cluster, learners with hearing impairment attending schools such as Chamabondo, Chinotimba, Baobab, St. Josphine Bhakitar, and Mkhosana Adventist experience considerable communication challenges, particularly in mastering Zimbabwe Sign Language. International and national legislation emphasises language as a fundamental medium of instruction and communication, advocating for equitable access to learning resources (Mupedziswa, 2019; Jansen, 2013). Local initiatives, including the Nziramasanga Commission, the National Disability Policy, and the Disability Act, further affirm the right of every child to access appropriate resources necessary for language and cognitive development during primary education.

Despite government support through the Department of Schools Psychological Services, the provision of assistive resources is often slow and predominantly focused on hearing aids. Although all schools in Victoria Falls have benefited from this initiative, limited consideration has been given to the fact that learners with severe hearing loss are predominantly visual learners. African studies underscore the effectiveness of visual technology in enhancing learning outcomes among learners with hearing impairment. For instance, Joel, Kochung, Kabuka, Charles, and Oracha (2013) found that limited access to visual equipment significantly hindered learning in Kenyan schools.

Although some schools in Victoria Falls have established computer laboratories, the available desktop computers are insufficient relative to enrolment levels. Moreover, learners with hearing impairment are not allocated dedicated time to access these facilities, and many laboratories are managed by teachers with limited ICT competence. Alnahdi (2014) observed that visual technological equipment motivates teachers to integrate ICT into instruction, a finding supported by the Gallaudet Research Institute (2015) and Sutherland, Johnson, and Flexer (2019), who reported improved motivation, speech perception, and independent learning among learners with hearing impairment. Nkansah and Unwin (2012) and Lidström and Hemmingsson (2011) identified a range of ICT tools—including multimedia applications, AAC systems, and adaptive devices—that support communication and learning. However, inadequate infrastructure and limited equipment continue to undermine effective implementation (Alfaraj & Kuyini, 2014; Alnahdi, 2014).

Zimbabwe has made deliberate efforts to strengthen special education services, including training teachers through initiatives such as the Presidential Teacher Capacitation Programme. These efforts align with global calls by UNESCO (2009) to ensure not only access to education for learners with disabilities but also the provision of adequate support to achieve educational goals. Despite these developments, schools within Victoria Falls Cluster continue to face acute shortages of computers and visual technological equipment, compounded by economic constraints that limit household access to digital technologies (Chitiyo & Wheeler, 2004; Chitiyo, 2007; Charema, 2007).

Policy implementation gaps, limited stakeholder engagement, and inadequate awareness of inclusive education frameworks among school administrators further hinder equitable access to learning opportunities. Equalisation of opportunities for learners with hearing impairment remains a critical concern, particularly as appropriate equipment facilitates communication between teachers and learners. Against this background, the present study evaluated the implementation of visual technological equipment by learners with hearing impairment in primary schools within the Victoria Falls Cluster—specifically Chamabondo, Chinotimba, Baobab, St. Josphine Bhakitar, and Mkhosana Adventist—focusing on the challenges encountered and possible solutions.

Statement of the Problem

Despite national and international commitments to inclusive education, learners with hearing impairment in primary schools in Zimbabwe continue to face substantial barriers to equitable learning. Government support through the Department of Schools Psychological Services has largely prioritized the provision of hearing aids, with limited emphasis on visual technological equipment (VTE), which is more suitable for learners who are deaf or hard of hearing (Chireshe, 2011; Machingura, 2017). In the Victoria Falls Cluster, most primary schools lack adequate VTE, and where technology exists, it is often audio-based or under-utilized due to limited teacher training, misconceptions, and financial constraints (Obiakor & Afolabi, 2017; Johnson et al., 2018). The absence of structured support systems and effective policy implementation further restricts teachers' capacity to integrate VTE into teaching and learning. Consequently, learners with hearing impairment experience reduced access to curriculum content, limited opportunities for meaningful participation, and compromised academic outcomes (Makalela & Kgware, 2019). Despite evidence supporting the effectiveness of VTE, empirical research examining its implementation, challenges, and potential solutions within the Victoria Falls Cluster remains scarce, necessitating the present study.

Research Objectives

The study is underpinned by four objectives. These are firstly to examine the types of visual technological equipment currently available and used by learners with hearing impairment in primary schools within the Victoria Falls Cluster. Secondly. The study aims to explore the perceptions and experiences of teachers and school heads regarding the use of visual technological equipment in teaching learners with hearing impairment. The third objective is to identify the challenges affecting the effective implementation and utilisation of visual technological equipment for learners with hearing impairment. Lastly, to propose practical and context-specific strategies for improving the availability, utilisation, and effectiveness of visual technological equipment for learners with hearing impairment in primary schools within the Victoria Falls Cluster.

Purpose of the Study

The purpose of this study was to investigate the implementation of visual technological equipment in supporting learners with hearing impairment in primary schools within the Victoria Falls Cluster. The study aimed to identify existing challenges and propose practical solutions to enhance effective and inclusive teaching and learning, thereby promoting equitable access and improved academic outcomes for learners with hearing impairment (Makalela & Kgware, 2019; Chireshe, 2011).

Significance of the Study

This study is significant in several ways:

- It provides evidence-based insights to the Ministry of Primary and Secondary Education, school administrators, and teachers on the availability, use, and challenges of VTE in primary schools.
- The findings highlight the need for targeted teacher training and capacity building in inclusive education practices that leverage visual technological resources (Johnson et al., 2018; Edyburn, 2015).
- The study contributes to improved instructional practices by demonstrating how VTE supports dual-channel processing, reduces cognitive barriers, and facilitates equitable learning for learners with hearing impairment (Mayer, 1997; Triarini, 2017).
- It adds to the body of knowledge on inclusive education in Zimbabwe and similar African contexts, offering practical recommendations for enhancing access, participation, and learning outcomes for learners with hearing impairment.
- Finally, the study provides a foundation for future policy formulation and resource allocation decisions aimed at strengthening the implementation of visual technological equipment in inclusive classrooms.

THEORETICAL FRAMEWORK

This study is grounded in Multimedia Learning Theory (MMLT), developed by Richard Mayer (1997), which is rooted in the broader Cognitive Theory of Learning. MMLT posits that learners achieve deeper understanding and improved retention when information is presented through multiple representational modes, particularly visual and auditory channels. The theory is particularly relevant for learners with hearing impairment, for whom the visual channel serves as the dominant pathway for processing information.

Mayer (1997) outlines three core principles of MMLT:

1. **Dual Coding Principle:** Learning is enhanced when learners receive information through both verbal and visual channels, enabling coherent mental representations. For learners with hearing impairment, visual representations such as images, diagrams, videos, and captioned multimedia compensate for reduced auditory input. Research shows that visual learning tools improve comprehension, inferencing skills, and engagement (Siagian, Sahat Saragi, & Sinaga, 2019; Marcus et al., 2018).
2. **Limited Capacity Principle:** Learners possess a finite capacity for processing information at any time. Overloading learners with poorly structured information impedes learning. Well-designed visual materials—simplified graphics, paced videos, and focused multimedia presentations—reduce cognitive load for learners with hearing impairment (Mayer, 1997).
3. **Active Processing Principle:** Learners construct knowledge actively through summarising, questioning, self-explanation, and reflection. Visual technological equipment supports active engagement via simulations, visual storytelling, captioned videos, and interactive digital platforms, promoting meaningful connections with prior knowledge (Mayer, 2009; Moreno & Mayer, 2007).

By applying MMLT, this study views **visual technological equipment (VTE)** as a cognitive scaffold that enhances comprehension, reduces barriers to learning, and enables dual-channel processing. The theory

provides a robust framework for evaluating how VTE affects academic outcomes and inclusive learning experiences for learners with hearing impairment in primary schools within the Victoria Falls Cluster.

Conceptual Framework

The **conceptual framework** visually and theoretically depicts how the **implementation of Visual Technological Equipment (VTE)** influences the **learning outcomes of learners with hearing impairment**.

- **Independent Variable:** Implementation of VTE, encompassing tools such as interactive whiteboards, educational software, captioned videos, diagrams, charts, and other visual aids intended to enhance engagement, comprehension, and access to curriculum content for learners with hearing impairment (Moyle, 2006; Triarini, 2017).

- **Dependent Variable:** Learning outcomes of learners with hearing impairment, measured through indicators such as academic performance, communication skills, social interaction, participation, and school attendance.

The framework proposes that **effective implementation of VTE**—supported by teacher training, institutional support, and policy guidance—leads to **improved learning outcomes**, equitable participation, and meaningful engagement in inclusive classrooms. Conversely, inadequate access, lack of training, or insufficient support may limit the benefits of VTE, reflecting barriers to dual-channel learning as suggested by Multimedia Learning Theory (Mayer, 1997; Moreno & Mayer, 2007).

Diagram: (A conceptual diagram could show VTE implementation on the left as the independent variable, arrows pointing to learning outcomes as the dependent variable, with teacher capacity, policy support, and resource availability as moderating factors.)

LITERATURE REVIEW

1. Types of Visual Technological Equipment (VTE) Used by Learners with Hearing Impairment

Globally, visual technological equipment (VTE) is recognised as essential for supporting learners with hearing impairment, as it enhances access to curriculum content through images, text, symbols, and multimedia (Mayer, 1997). Commonly used tools include **computers, tablets, interactive whiteboards, overhead projectors, captioned videos, animations, and multimedia learning platforms**, all of which support comprehension, motivation, and independent learning (Gallaudet Research Institute, 2015; Sutherland et al., 2019; Marcus et al., 2018). Research indicates that effective use of these tools depends largely on **teacher competence, institutional support, and adequate infrastructure** (Flexer, 2017; Johnson et al., 2018).

In African contexts, access to VTE is constrained by **economic and infrastructural limitations**. In Nigeria, primary schools often lack computers, projectors, and multimedia instructional tools, and teachers frequently lack training for effective use (Obiakor & Afolabi, 2017; Ogunleye, 2015). Similarly, Botswana has policy support for inclusive education, yet inadequate resources and professional capacity limit VTE integration (Kgaphola & Tsheko, 2017; Makalela & Kgware, 2019). In Kenya, limited access to visual materials hinders learning outcomes for learners with hearing impairment (Joel et al., 2013).

In Zimbabwe, VTE use remains limited. Schools rely primarily on **sign language, charts, printed visuals, and occasional computer use**, with audio-based technologies (hearing aids, FM systems) predominant (Chireshe, 2011; Machingura, 2017). Policy support exists (Zimbabwe Ministry of Primary and Secondary Education, 2016), but financial constraints, inadequate equipment, and teacher preparedness hinder effective integration. In the Victoria Falls Cluster, this scarcity justifies the study's focus on available VTE and its utilisation in primary schools.

2. Teachers' and School Heads' Perceptions of Visual Technological Equipment

Educator perceptions significantly influence VTE implementation. **Positive attitudes** toward assistive and visual technologies increase adoption and effective classroom integration (Mayer, 1997; Sutherland et al.,

2019). Teachers who perceive VTE as useful and manageable are more likely to use multimedia tools that enhance learner engagement and comprehension (Johnson et al., 2018).

In Africa, educator perceptions are mixed. Ogunleye (2015) found that teachers recognise VTE's value but feel unprepared to use it effectively. Kgaphola and Tsheko (2017) reported that school administrators support inclusion but face challenges from insufficient resources and limited professional development. In Zimbabwe, Chireshe (2011) noted that teachers rely on traditional instructional methods due to limited exposure to VTE, while Machingura (2017) highlighted financial and infrastructural constraints among school heads. These findings underscore the importance of examining perceptions in the Victoria Falls Cluster to inform context-specific strategies.

3. Challenges Affecting the Implementation of VTE

Globally, VTE implementation is hindered by **insufficient teacher training, limited technical support, and inadequate funding**, which compromise inclusive classroom integration (Johnson et al., 2018; Edyburn, 2015). Even with supportive policies, gaps persist between policy intent and classroom practice due to weak implementation frameworks (IDEA, 2004).

In Africa, economic constraints, infrastructure gaps, and teacher expertise further impede effective VTE use (Obiakor & Afolabi, 2017; Ogunleye, 2015; Makalela & Kgware, 2019). In Zimbabwe, challenges include **limited equipment, overreliance on audio-based technologies, insufficient teacher training, and budgetary constraints**, resulting in weak policy implementation and minimal stakeholder engagement (Chireshe, 2011; Machingura, 2017). These barriers limit dual-channel processing, reduce learner participation, and compromise inclusive pedagogy, necessitating targeted interventions in the Victoria Falls Cluster.

4. Strategies for Improving VTE Use

Literature highlights that effective VTE integration requires a combination of **policy support, resource provision, and teacher capacity building**. Globally, strategies include sustained government funding, provision of appropriate visual and assistive technologies, and continuous professional development to enhance teacher competence and confidence (Edyburn, 2015; Johnson et al., 2018). Schools embedding VTE use within inclusive education frameworks with technical support demonstrate improved utilisation and learner outcomes (Sutherland et al., 2019).

In African contexts, **low-cost VTE, targeted teacher training, partnerships with NGOs, and institutional support** are critical (Obiakor & Afolabi, 2017; Eleweke, 2017; Makalela & Kgware, 2019). In Zimbabwe, scholars recommend **policy implementation reviews, increased budget allocation for inclusive education, and specialised VTE training** for teachers and school heads (Chireshe, 2011; Machingura, 2017). Strengthened stakeholder engagement and a shift from audio-based to visual technology interventions are essential to enhancing equitable learning outcomes, particularly in the Victoria Falls Cluster.

RESEARCH METHODOLOGY

Research Philosophy

This study adopted an **interpretivist research philosophy**, suitable for exploring human experiences, perceptions, and meanings within specific social contexts (Creswell, 2014; Saunders, Lewis, & Thornhill, 2019). Interpretivism assumes that reality is socially constructed and knowledge emerges from individuals' subjective interpretations. Given the study's focus on teachers' and school heads' experiences, perceptions, and challenges regarding the implementation of visual technological equipment (VTE) for learners with hearing impairment, interpretivism enabled rich, contextualized insights. It facilitated understanding of how participants interact with VTE within inclusive primary school settings and accounted for social, institutional, and cultural influences on technology use.

Research Design

A **qualitative research design** was employed to explore in depth the availability, use, challenges, and potential solutions related to VTE in primary schools within the Victoria Falls Cluster (Creswell, 2014; Denzin & Lincoln, 2018). Qualitative methods allowed the researcher to describe, interpret, and explain phenomena from participants' perspectives, focusing on meaning rather than numerical measurement. This design aligned with the study's objectives of examining perceptions, experiences, and challenges in inclusive classrooms, providing context-specific insights to inform policy and practice.

Population, Sample, and Sampling Method

Population:

The study population comprised all primary schools in the Victoria Falls Cluster that enrol learners with hearing impairment. Participants included **learners with hearing impairment, special needs teachers, mainstream teachers involved in inclusive education, school heads, and resource unit coordinators**, as these groups are directly involved in the implementation and utilisation of VTE.

Sample:

The sample included selected primary schools with learners with hearing impairment in the Victoria Falls Cluster. Within these schools, learners, teachers, and administrators were purposively selected to obtain **information-rich cases**. The sample ensured representation of multiple perspectives on VTE implementation while remaining manageable within time and resource constraints.

Sampling Method:

A **purposive sampling** technique was employed to select schools and participants with direct experience in VTE use. Additionally, **convenience sampling** was used for learners who were readily available and willing to participate. This combination enhanced the relevance and credibility of the data collected by targeting participants with firsthand knowledge of VTE integration in teaching and learning.

Data Collection Instruments and Methods

The study employed multiple qualitative methods to capture a comprehensive understanding of VTE implementation:

Semi-Structured Interviews:

Interviews were conducted with **special needs teachers, mainstream teachers, school heads, and resource coordinators** using interview guides. The semi-structured format allowed consistency across participants while enabling probing of emerging issues. Interviews explored availability, utilisation, challenges, and perceived benefits of VTE.

Classroom Observations:

Observations provided firsthand information on how VTE was implemented during teaching and learning. An observation guide focused on **types of equipment used, learner engagement, teacher–learner interaction, and suitability of VTE** for learners with hearing impairment. Observations validated and complemented interview data.

Focus Group Discussions (FGDs):

FGDs were conducted with learners with hearing impairment to capture collective experiences. Sign language interpreters facilitated effective communication and ensured learners' perspectives were accurately represented.

Document Analysis:

Relevant school documents—**lesson plans, inclusive education policies, VTE inventories, and schemes of work**—were reviewed to provide contextual background and triangulate data from interviews, observations, and FGDs.

Ethical Considerations

The study adhered to rigorous ethical standards:

- **Permission and Consent:** Approval to conduct research was obtained from relevant educational authorities and school administrators. Written informed consent was obtained from all adult participants, while parental consent and learner assent were obtained for minors using accessible communication methods.
- **Confidentiality and Anonymity:** Pseudonyms were used for participants and schools. Identifying details were omitted from transcripts and reports.
- **Non-Maleficence and Respect:** Participation posed no physical, emotional, or psychological harm. Data collection was conducted in a culturally sensitive and supportive manner.
- **Accessibility and Inclusivity:** Methods were adapted to meet the communication needs of learners with hearing impairment, including the use of sign language interpreters and visual prompts.

These ethical measures enhanced the **trustworthiness, credibility, and integrity** of the study while ensuring equitable participation.

FINDINGS AND DISCUSSIONS

Findings on the types of visual technological equipment used were derived from **interviews, focus group discussions, lesson observations, and document analysis**. The results are presented by participant group, supported with verbatim responses, and then discussed in relation to existing literature.

Theme: Predominance of Basic Visual Technologies in Supporting Inclusive Learning

Learners with hearing impairment identified basic visual tools as the most consistently used learning aids:

"We mostly use pictures, charts, and sometimes videos on the projector to understand lessons." (Learner with hearing impairment)

Teachers of learners with hearing impairment confirmed reliance on low-tech and mid-tech visual equipment:

"Charts, flashcards, videos, and occasional projector use are the main visual technologies available to support these learners." (Teacher of learners with hearing impairment)

Mainstream teachers noted similar patterns across inclusive classrooms:

"PowerPoint slides, diagrams, and printed visuals are the most practical tools we use." (Mainstream teacher)

School heads attributed this trend to resource realities:

"Schools mainly have basic visual equipment; advanced assistive technologies are limited by funding." (School Head)

Lesson observations and document analysis confirmed frequent use of charts, diagrams, textbooks with visuals, and sporadic projector use, with minimal evidence of specialised assistive devices. Aligned with **Multimedia Learning Theory**, these visual tools support dual-channel processing, while reflecting Zimbabwe's **Inclusive Education Policy (2023)** emphasis on **reasonable accommodation and equitable access** within available resources.

The findings align with literature indicating that, despite the recognised value of visual technological equipment for learners with hearing impairment (Mayer, 1997), schools often rely on basic visual tools. Consistent with Nkansah and Unwin (2012), teachers in the Victoria Falls Cluster predominantly used charts, printed visuals, and occasional projectors, reflecting limited access to advanced technologies. Similar to studies in Nigeria, Botswana, and Kenya, resource and funding constraints restricted availability and utilisation

(Obiakor & Afolabi, 2017; Kgaphola & Tsheko, 2017; Joel et al., 2013). In line with Zimbabwean studies, reliance on low-tech visuals demonstrates partial fulfilment of inclusive education policy through reasonable accommodation rather than full multimedia integration.

FINDINGS AND DISCUSSION

Theme 1: Predominance of Basic Visual Technologies in Supporting Inclusive Learning

Finding:

Learners with hearing impairment identified basic visual tools as the most consistently used learning aids:

"We mostly use pictures, charts, and sometimes videos on the projector to understand lessons." (Learner with hearing impairment)

Teachers of learners with hearing impairment confirmed reliance on low- and mid-tech equipment:

"Charts, flashcards, videos, and occasional projector use are the main visual technologies available to support these learners." (Teacher of learners with hearing impairment)

Mainstream teachers and school heads noted similar trends:

"PowerPoint slides, diagrams, and printed visuals are the most practical tools we use." (Mainstream teacher)
"Schools mainly have basic visual equipment; advanced assistive technologies are limited by funding." (School Head)

Lesson observations and document analysis confirmed frequent use of charts, diagrams, textbooks with visuals, and sporadic projector use, with minimal evidence of specialised assistive devices.

DISCUSSION

This finding aligns with literature indicating that, despite the recognised value of visual technological equipment for learners with hearing impairment, schools often rely on basic tools (Nkansah & Unwin, 2012; Mayer, 1997). Similar constraints are reported in Nigeria, Botswana, Kenya, and Zimbabwe, where economic, infrastructural, and resource limitations restrict access to advanced visual technologies (Obiakor & Afolabi, 2017; Joel et al., 2013; Chireshe, 2011; Machingura, 2017). Aligned with **Multimedia Learning Theory (MMLT)**, these basic tools still support dual-channel processing and facilitate learning, although advanced multimedia integration is limited. The reliance on charts and diagrams reflects partial compliance with Zimbabwe's Inclusive Education Policy (2023), prioritising reasonable accommodation within available resources.

Theme 2: Visual Technological Equipment as a Cognitive Scaffold

Finding:

Participants consistently perceived visual technological equipment as central to learning for learners with hearing impairment. A learner noted:

"When the teacher uses pictures and videos on the screen, I understand faster because I can see what is being explained."

Teachers emphasised that visual technologies function as core instructional scaffolds:

"Visual technology is their main access point. Videos and diagrams help learners grasp concepts that are difficult to explain using sign language alone."

Mainstream teachers and school heads corroborated its broader impact:

"Using slides and videos improves engagement for learners with hearing impairment and benefits the whole class." (Mainstream teacher)
"Learners with hearing impairment show better attention and participation in classes where visual technology is consistently used." (School Head)

Lesson observations showed that when visual technologies were integrated, learners demonstrated improved attention, faster task completion, and accurate responses to visual prompts.

DISCUSSION

These experiences illustrate Mayer's **dual-channel assumption**, where visual representations compensate for limited auditory input and reduce cognitive overload (Mayer, 1997; Moreno & Mayer, 2007). Positive teacher and school head perceptions facilitate adoption of visual technological equipment, consistent with global findings that educator attitudes significantly influence effective integration (Sutherland et al., 2019; Ogunleye, 2015). Unlike earlier Zimbabwean studies reporting reliance on traditional methods (Chireshe, 2011; Machingura, 2017), this study shows deliberate scaffolding through visual technologies. These tools operationalise Multimedia Learning Theory principles, enhancing cognitive processing and inclusive pedagogy.

Theme 3: Resource Constraints and Limited Teacher Capacity as Barriers

Finding:

Learners reported inconsistent access to visual technological equipment:

"Sometimes the projector is not working or there is no electricity, so the lesson becomes difficult to follow."

Teachers highlighted limited resources and training:

"We know visual technology is important, but we lack adequate equipment and specialised training to use it effectively." (Teacher of learners with hearing impairment)

Mainstream teachers noted time constraints and limited confidence:

"Preparing visual materials takes time, and not all teachers are trained to modify them for learners with hearing impairment."

School heads cited financial limitations:

"Budgetary constraints affect the availability and maintenance of visual technological equipment."

Observations confirmed sporadic use of visual tools, and document analysis revealed minimal allocation for assistive technologies.

Discussion:

These findings corroborate literature showing that insufficient teacher training, technical support, and funding hinder effective technology integration (Johnson et al., 2018; Edyburn, 2015). In Africa, economic constraints and limited infrastructure further restrict access to visual technologies (Obiakor & Afolabi, 2017; Ogunleye, 2015). In Zimbabwe, limited teacher capacity and inadequate funding undermine policy implementation, highlighting gaps between policy intent and classroom practice (Chireshe, 2011; Machingura, 2017). These barriers reduce dual-channel learning opportunities and increase cognitive load, limiting the benefits of visual technological equipment as prescribed by Multimedia Learning Theory.

Theme 4: Reasonable Accommodation through Visual Technologies

Finding:

Learners emphasised consistent visual support:

"If pictures and videos are always used, we can learn like other children."

Teachers highlighted capacitation:

"Inclusive education requires training teachers to create visual materials suited to learners with hearing impairment."

Mainstream teachers linked VTE to inclusive classrooms:

"Using visual resources helps us meet diverse learning needs without separating learners."

School heads underscored systemic support:

"Policy supports inclusion, but schools need dedicated funding for assistive technologies."

Lesson observations revealed reliance on improvised visuals and minimal budgetary allocation.

Discussion:

These findings align with literature advocating policy support, resource provision, and capacity building for effective VTE integration (Edyburn, 2015; Johnson et al., 2018; Obiakor & Afolabi, 2017). Positive teacher attitudes, low-cost adaptive technologies, and institutional backing enhance inclusive learning outcomes (Makalela & Kgware, 2019; Chireshe, 2011). In line with **Multimedia Learning Theory**, consistent visual support reduces cognitive barriers, promotes dual-channel processing, and facilitates meaningful participation for learners with hearing impairment. This operationalises Zimbabwe's commitment to equitable access and reasonable accommodation in primary schools.

Theme: Visual Technological Equipment as a Cognitive Scaffold for Learning

In line with **Multimedia Learning Theory (MMLT)**, which posits that learners understand concepts better when information is presented through coordinated visual and verbal channels, participants consistently perceived visual technological equipment as central to learning for learners with hearing impairment.

A learner with hearing impairment emphasized the primacy of visual input in meaning-making:

"When the teacher uses pictures and videos on the screen, I understand faster because I can see what is being explained." (Learner with hearing impairment)

This experience reflects Mayer's **dual-channel assumption**, where visual representations compensate for limited access to auditory information and reduce cognitive overload.

Teachers of learners with hearing impairment corroborated this view, noting that visual technologies function as essential instructional scaffolds rather than supplementary tools:

"Visual technology is their main access point. Videos and diagrams help learners grasp concepts that are difficult to explain using sign language alone." (Teacher of learners with hearing impairment)

Mainstream teachers further validated the effectiveness of multimedia resources in inclusive classrooms:

"Using slides and videos improves engagement for learners with hearing impairment and benefits the whole class." (Mainstream teacher)

At the institutional level, school heads linked visual technological equipment to improved instructional outcomes and inclusive practice:

"Learners with hearing impairment show better attention and participation in classes where visual technology is consistently used." (School Head)

Lesson observations and document analysis **corroborated interview findings** and further aligned the use of visual technological equipment with **Multimedia Learning Theory**. Schemes of work, lesson plans, and progress records consistently indicated planned use of videos, diagrams, charts, and projected images. Classroom observations showed that when visual technologies were integrated, learners with hearing impairment demonstrated improved attention, faster task completion, and accurate responses to visual prompts. Teachers relied more on visual sequencing and demonstrations than oral explanations, reducing cognitive load and supporting dual-channel processing. These convergent data sources confirm that visual technological equipment functions as a deliberate cognitive scaffold in inclusive instruction.

Overall, the convergence of learner, teacher, and school head perspectives demonstrates that visual technological equipment operationalises the principles of Multimedia Learning Theory by enhancing cognitive processing, reducing learning barriers, and supporting inclusive pedagogy for learners with hearing impairment.

he findings align with literature showing that positive teacher and school head perceptions facilitate effective integration of visual technological equipment (Mayer, 1997; Sutherland et al., 2019). Consistent with Ogunleye (2015) and Kgaphola and Tsheko (2017), participants recognised the instructional value of visual technologies but relied on them primarily as core access tools rather than optional aids. Unlike earlier Zimbabwean studies that reported predominant reliance on traditional methods (Chireshe, 2011; Machingura, 2017), this study demonstrates growing pedagogical alignment with Multimedia Learning Theory, evidenced by deliberate visual scaffolding. However, the sustained effectiveness of such practices remains contingent on institutional support and teacher capacity development.

Theme: Resource Constraints and Limited Teacher Capacity as Barriers to Multimedia Learning

Learners with hearing impairment reported inconsistent access to visual technological equipment, which disrupted learning continuity:

"Sometimes the projector is not working or there is no electricity, so the lesson becomes difficult to follow." (Learner with hearing impairment)

Teachers of learners with hearing impairment elaborated that limited resources and insufficient training constrained effective multimedia integration:

"We know visual technology is important, but we lack adequate equipment and specialised training to use it effectively." (Teacher of learners with hearing impairment)

Mainstream teachers echoed these challenges, citing time constraints and limited confidence in adapting multimedia materials:

"Preparing visual materials takes time, and not all teachers are trained to modify them for learners with hearing impairment." (Mainstream teacher)

School heads attributed these challenges to funding limitations and competing institutional priorities:

"Budgetary constraints affect the availability and maintenance of visual technological equipment." (School Head)

Lesson observations confirmed sporadic use of visual tools, while document analysis revealed minimal allocation for assistive technologies. These challenges undermine **Multimedia Learning Theory's** principles by limiting sustained dual-channel processing and increasing cognitive load for learners with hearing impairment.

The findings corroborate global and African literature indicating that inadequate training, limited resources, and funding constraints hinder effective use of visual technological equipment (Johnson et al., 2018; Edyburn, 2015; Ogunleye, 2015). Consistent with Zimbabwean studies (Chireshe, 2011; Machingura, 2017), learners in the Victoria Falls Cluster experienced disrupted lessons due to sporadic equipment availability and unreliable infrastructure. Teachers' limited confidence and mainstream teachers' time constraints further restricted multimedia integration, while school heads cited budgetary limitations. These barriers compromise dual-

channel processing central to Multimedia Learning Theory and highlight persistent gaps between inclusive education policy intent and classroom practice.

Reasonable Accommodation through Visual Technologies in Inclusive Classrooms

Learners with hearing impairment emphasised the need for consistent visual support as a condition for equitable learning:

"If pictures and videos are always used, we can learn like other children." (Learner with hearing impairment)

Teachers of learners with hearing impairment highlighted teacher capacitation as central to inclusive practice:

"Inclusive education requires training teachers to create visual materials suited to learners with hearing impairment." (Teacher of learners with hearing impairment)

Mainstream teachers viewed visual technologies as enabling non-segregated instruction:

"Using visual resources helps us meet diverse learning needs without separating learners." (Mainstream teacher)

School heads linked implementation challenges to systemic support:

"Policy supports inclusion, but schools need dedicated funding for assistive technologies." (School Head)

Lesson observations and document analysis revealed reliance on improvised visuals and limited budgetary allocation for assistive technologies. These findings operationalise Zimbabwe's commitment to **equitable access and reasonable accommodation** as articulated in **Section 81 of the Constitution of Zimbabwe (2013)**, the **Education Act [Chapter 25:04]**, and the **Inclusive Education Policy (2023)**. Consistent with **Multimedia Learning Theory**, visual technological equipment reduces cognitive barriers and supports dual-channel processing, thereby enabling meaningful participation of learners with hearing impairment in inclusive primary school classrooms.

The findings align with literature emphasizing that effective use of visual technological equipment requires policy support, resource provision, and teacher capacitation (Edyburn, 2015; Johnson et al., 2018). In the Victoria Falls Cluster, learners' call for consistent visual support and teachers' emphasis on training reflect global and African recommendations for sustained professional development and low-cost, adaptable technologies (Obiakor & Afolabi, 2017; Makalela & Kgware, 2019). School heads' recognition of funding needs underscores the role of institutional support in operationalising inclusive education policies (Chireshe, 2011; Machingura, 2017). These strategies, aligned with Multimedia Learning Theory, reduce cognitive barriers and enable equitable, dual-channel learning.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The findings indicate that there was lack of visual technological equipment in schools that could benefit learners who use Sign Language as well as lack of knowledge in teachers about the relevance of visual equipment in the acquisition of Sign Language. This makes one to wonder why the government introduced Sign language before making sure that visual technological equipment was made available in schools as well as making sure that teachers were well educated to effectively use visual technological equipment tools when teaching deaf learners.

The study revealed deplorable situations of learners with hearing impairment in inclusive schools where they are forced to hear when they cannot hear. Marschark (2007); Rekkedal et al (2012) as well as Shalrilyn (2011) concur with the findings that schools are furnished with irrelevant equipment used to teach visual learners. Also, findings from analyzed documents showed that the teaching media column reflected audio equipment that were used to aid the teacher in the delivery of lessons focusing on auditory training and development of spoken language. As a result, learners who use Sign Language or those with hearing impairment fail to access their mother language for social and academic activities

On the other hand, the study also concludes that VTE has a positive impact on academic achievement as it improves the results of students in the teaching and learning process. The majority of the respondents were computer literate as they could use a computer to process and store data for teaching and learning purposes.

The majority of the respondents also frequently used VTE tools in in the teaching and learning process. The research also found out that teachers have a positive attitude towards the use and integration of gadgets like computers and tablets in their day-to-day lesson preparation and delivery. It was also noted that e-learning through use of computers does enhance effective teaching as both teachers and students get the opportunity to research on the internet and discover a vast array of information which leads to the attainment of learning outcomes and hence improve the learning outcomes. The majority of the respondents were also very much confident in the use of VTE tools. The majority of the respondents also noted that computers and tablets are mostly used for research purposes and used to draft notes, lesson handouts, and students' tasks and generate students' examinations by downloading examination materials. The mostly used VTE tools are the desktop computers, laptops, smart phones and the overhead projector. The majority of the respondents further highlighted that VTE is beneficial as they get to research further on the syllabus topics and students also have an opportunity to engage in online lessons which further improves the students, grasping of concepts.

However, the research exposed that there was a general lack of adequate VTE tools in schools. This was cited as a major hindrance emanating from inadequate financial resources in schools.

The other problem was that some teachers do not have knowledge of VTE. Some respondents did not return questionnaires on time prompting the researcher to delay putting the research project together.

RECOMMENDATIONS

The following recommendations were made:

Cluster:

1. **Teacher and School Head Capacity Building:** Continuous professional development programs should be implemented to train teachers and school heads in designing and integrating visual technological equipment into lessons, ensuring alignment with Multimedia Learning Theory and effective dual-channel instruction.

2. **Resource Provision and Infrastructure Support:** Schools should receive dedicated funding and infrastructure support, including functional projectors, stable electricity, and maintenance plans, to ensure consistent and uninterrupted access to visual technologies.

3. **Context-Specific Visual Strategies:** Low-cost, locally adaptable visual resources such as charts, flashcards, and videos should be developed and shared collaboratively among teachers. These strategies should be embedded within Zimbabwe's Inclusive Education Policy to promote equitable access and reasonable accommodation.

4. **Equipment Audit and Enhancement:** Regular audits of existing visual technological equipment should be conducted, and schools should be supported to supplement basic tools with advanced assistive technologies, ensuring all learners with hearing impairment benefit from materials that facilitate cognitive processing and meaningful engagement.

SUMMARY, CONCLUSION, AND RECOMMENDATIONS

Summary of Findings

1. **Types of Visual Technological Equipment (VTE) Used**

   The study found that learners with hearing impairment primarily used **basic visual tools** such as charts, flashcards, diagrams, textbooks with visuals, PowerPoint slides, and occasionally videos. Advanced assistive technologies were scarce due to funding and infrastructural constraints. Lesson observations

and document analysis confirmed limited access to specialised VTE, aligning with global and African studies showing resource limitations as a barrier to inclusive education (Nkansah & Unwin, 2012; Obiakor & Afolabi, 2017).

2. **Perceptions of Teachers and School Heads**

   Teachers and school heads recognised the instructional value of visual technologies. Learners viewed VTE as central to comprehension, while teachers emphasised the need for professional training. School heads highlighted policy support but noted financial constraints. Positive perceptions facilitated use of available tools, consistent with literature showing educator attitudes strongly influence VTE integration (Sutherland et al., 2019; Ogunleye, 2015).

3. **Challenges Affecting Implementation**

   Key barriers included inconsistent access to VTE, unreliable infrastructure, limited teacher capacity, time constraints, and financial limitations. These hindered dual-channel processing and reduced learners' engagement. Findings are consistent with Zimbabwean studies indicating that inadequate teacher training, overreliance on audio-based technologies, and funding constraints compromise inclusive practices (Chireshe, 2011; Machingura, 2017).

4. **Strategies for Effective Implementation**

   Learners emphasised the need for consistent visual support, teachers highlighted the importance of capacitation, and school heads stressed systemic support. Improvised visuals were commonly used due to limited resources. These strategies align with literature advocating policy backing, low-cost adaptive technologies, and ongoing professional development to enhance learning outcomes (Edyburn, 2015; Makalela & Kgware, 2019).

CONCLUSIONS

1. **Types of VTE Used:**

   Primary schools in the Victoria Falls Cluster predominantly rely on **low- and mid-tech visual tools**, with advanced assistive devices largely unavailable. This limits full engagement and comprehension for learners with hearing impairment, despite their positive impact when accessible.

2. **Perceptions of Educators:**

   Teachers and school heads recognise the value of VTE and its role in promoting inclusive learning, but **limited training and resources constrain effective integration**. Learners depend heavily on visual input for meaningful participation.

3. **Implementation Challenges:**

   Persistent **resource limitations, inadequate teacher capacitation, and inconsistent access to technology** hinder multimedia learning, reduce dual-channel processing, and compromise the inclusive education policy objectives.

4. **Potential Strategies:**

   When available and well-integrated, VTE **enhances comprehension, reduces cognitive load, and promotes engagement**. Consistent support, teacher training, and systemic investment are necessary to operationalise Multimedia Learning Theory and Zimbabwe's inclusive education mandates.

Recommendations

Objective 1: Examine types of visual technological equipment used

- Schools should **prioritise acquisition of advanced visual technologies** (e.g., interactive whiteboards, captioned videos, tablets) alongside basic tools to ensure learners with hearing impairment access varied multimodal resources.

Objective 2: Explore perceptions of teachers and school heads

- **Continuous professional development programs** should be implemented to enhance teachers' and school heads' skills and confidence in using VTE for inclusive instruction.

Objective 3: Identify challenges affecting VTE implementation

- **Government and school authorities should allocate dedicated funding** for maintenance, procurement, and infrastructure to support consistent and reliable access to VTE.

Objective 4: Propose strategies for improving VTE availability and use

- Schools should **adopt low-cost adaptive technologies** and foster partnerships with NGOs and stakeholders to supplement resources while embedding VTE use into lesson planning and curriculum delivery.

- Establish **monitoring and support mechanisms** to ensure that VTE is effectively integrated into daily teaching and learning.

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Ethical Approval Statement

This study was conducted in accordance with established ethical research standards for studies involving human participants. Ethical approval was obtained from the Ministry of Primary and Secondary Education (MoPSE) – Matabeleland North Provincial Education Office, and permission to access schools was granted by the Hwange District Education Office.

Informed consent was obtained from teachers and administrators participating in interviews, while assent and parental/guardian consent were obtained for all learners with hearing impairment who took part in observational activities. Participation was voluntary, confidentiality was assured, and no identifying information is disclosed in this publication.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the research, authorship, or publication of this article. No financial, institutional, or personal relationships influenced the outcomes or interpretations presented in this study.

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