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Disablers of teaching mathematics to visually impaired learners: a case of Sefula School in zambia

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ABSTRACT

This study aimed to identify the disablers of teaching and learning Mathematics to Senior Secondary School learners with visual impairment (VI) in an inclusive classroom at Sefula Special School Zambia. Many developing countries face obstacles in implementing inclusive education which poses a challenge in delivering quality educational services to learners with special educational needs. Common barriers that constitute the main disablers in this case may range from inclusive policies to assistive technologies for inclusive education currently in place. In Zambia, the challenges may be exacerbated by inadequately trained Special Education teachers. To explore such disablers, the study applied the qualitative approach. It purposively drew a sample of 11 participants, i.e. 8 visually impaired Senior Secondary School learners and 3 teachers of mathematics in an inclusive classroom. The in-depth interviews and focus group discussion (FGD) qualitative methods of collecting primary data were applied, using open-ended and semi-structured interview guides as instruments for data collection. Secondary data were also collected existing literature. The data were analysed thematically. Lack of resource material, lack of access to ICT, teachers' negative attitude towards learners with Visual impairment and the lack of trained Special Education teachers in school, inflexible teaching methods and rigid assessment methods emerged as main themes in the study. The study contributes to the practice of teaching and learning as the findings would enhance the teaching and learning of the mathematics through modified teaching methods, creation of inclusive classroom environments and mentorship and coaching programmes among teachers. Assessment and evaluation would be enhanced through modified assessments and assistive devices to meet the diverse needs of learners. The study has an impact on the policy and advocacy as its absence result in draining tremendous efforts made towards inclusive teaching of mathematics. Researchers recommended to the Ministry of Education the need to devise a curriculum for learners with VI, to invest more in producing mathematics material for learners with VI, enhance CPDs by TCZ to equip teachers with inclusive teaching methodologies so as to improve teacher preparedness to deliver inclusive lessons to meet diverse needs of learners.

Keywords: Disablers, visual impairment, mathematics, inclusive education, special education, ICT

INTRODUCTION

The importance of mathematics among the key subjects that guarantee one entry to tertiary education institutions to study for a career that earns one a fortune to get employment in Zambia, cannot be overemphasised. This requirement has not been limited to the ordinary (sighted) learners, but extended to the learners with disabilities as well. For instance, to enrol at reputable higher learning institutions today, the Visually Impaired *(henceforth, VI)* are expected to have at least a pass or better in Mathematics at grade 12. Scholars have made crucial contributions to the subject matter of offering mathematics to the VI. For instance, Tindell (2016) has noticed that the VI learners should learn mathematical skills at the same level as their sighted counterparts. Unlike other subjects, however, imparting mathematics skills to the VI learners is most challenging. This is essentially because of the abstract nature of the subject. Interventional measures have, however, been proposed for the teaching of the subject to the VI learners, which have come after realising that the method of instructional assessment used and the instructional materials provided were constraining limitations in teaching mathematics to learners with VI (Oyebanji, 2021).

Guided by the Social Model theoretical underpinning, the main objective of the current study was to identify the disablers of teaching Mathematics to Senior Secondary School learners with visual impairment in an inclusive classroom at Sefula School for the Visually Impaired in Zambia. Of specific interest was, first, to establish the disablers in the teaching and learning of the subject experienced by teachers and the visually impaired learners in an inclusive classroom situation and, secondly, to determine how these barriers to teaching and learning affected the teaching and learning in the concerned subject by the concerned teachers and learners at the school.

Statement of the Problem

Despite an increased interest in offering mathematics in Special Education, challenges have persisted in teaching the subject to learners with visual impairment. Several studies conducted by scholars (Akakandelwa and Munsanje, 2011; Maguvhe, 2015; Lourens 2015, Simui *et al.* 2018; Oyebanji, 2021) confirm the disablers of teaching mathematics to learners with visual impairment in a classroom. However, major disablers of teaching mathematics to senior secondary school learners with visual impairment in an inclusive classroom in Zambia seem not to have been explored and are, therefore, not known. The researchers were curious to find out what the situation was at Sefula School for the Visually Impaired in Zambia.

Theoretical Underpinning

This study was guided by the Social Model theory (SMT). This theory posits that society's structures, norms and institutions can either enable or disable individuals, particularly those with disabilities. It emphasises the importance of social and environmental changes to promote inclusion, accessibility and equality. In short, the SMT focuses on the social and environmental factors that shape our experiences and opportunities.

The term social model is used by proponents opposed to the medical model's view of disability (Roulstone, Thomas, and Watson, 2012). Under the social model, it is argued that the medical model severely and unnecessarily restricts the roles that disabled people can play in life. Treating disabled people according to the medical model makes them dependent on certain (nondisabled) people and separates them from the rest of society.

The social model of disability is pivotal to understanding disability, as applied in the current study because it acknowledges that it is often the social barriers, such as prejudice and stereotypes; the way things are organised and run; and poor or no access to information,

buildings, and transport, which cause disability, rather than the impairments themselves. The main needs of a person with an impairment are the same as anyone else's: life, love, education, employment, having control and choice in one's life, and access to adequate services (including medical and rehabilitation when necessary). The challenge of disability centres on how society reacts (proactively and reactively) to the individual and his or her impairment in physical and social environments which are designed (by non-disabled people) to meet the needs of non-disabled people only. Under the social model, a person who has an impairment is disabled not only because of the impairment but also because of the attitudes of society and poorly constructed physical and social environments (Simui, *et al.* 2018; Bury, 2000).

Overall, the social model contributed enormously to disability dialogue and exposed the oppressive ideology of the past. However, in the recent past, the social model has come under scrutiny from challengers. Despite the most successful efforts to remove societal obstacles from the environment, some traces, limitations, and certain realities of a biologically informed disability would remain (*Ibid*).

LITERATURE REVIEW

The Situation Experienced by Learners with Disabilities from a Broader African Perspective

Several studies concerning learners with disabilities have been conducted in learning institutions. Among them are those championed by Megh Marath(2024); Daniel Wojahn, Stina Ericsson, Per-Olof Hedvall (2024); Eunyoung Jung(2024); Patrick Stefan Kermit (2024); Hilde Haualand, and Johan Hjulstad,. Back in Zambia, Daniel L. Mpolomoka Chitiyo, M., & Muwana (2018); Sophie Kasonde-Ng'andu (2022), and Central Statistical Office Lusaka (2018) have led the way.

In South Africa, a study conducted at various institutions of higher learning, using a phenomenological method, revealed many challenges linked to learners with disabilities. For instance, Participants in Lourens' (2015) study, which focused on the experiences of learners with visual impairment in the Western Cape region, showed that the learners were sometimes met with lecturers with negative attitudes, late delivery of course material and a lack of communication among important role-players. Several other aspects were explored. For instance, participants also discussed complex social interactions with non-disabled peers in an inclusive learning environment, which revealed issues based on changes the VI faced. Some among them were the problem of muscle tension and headaches they experienced while reading in environments with limited light, and the problem of accommodation, which was left entirely upon them to solve (*Ibid*).

Reacting on Lourens' (2015) findings, Simui *et al.* (2018) contend that the experiences of learners did not present variances based on different schools they attended, but rather on their visual type and the environment of secondary schooling played a critical role. They add that participants responsibility manage their physical and social environments, as well as their. Participants seemed resilient and innovative, yet the effort sometimes drained their energy and left them frustrated. Despite the efforts made in advocacy, very little was realised in terms of including learners with VI in ordinary learning settings.

Despite Lourens' (2015) findings not linking directly to teaching mathematics to students with VI, it may be applicable to the current study in the sense that it suggests to us how initiative the VI persons can be in an enabling environment with their abled counterparts.

Another study done in South Africa worth mentioning is one done by Maguvhe (2015). This one focused on the aspects that hindered the participation of VI learners not only in mathematics, but science education too. The study revealed that teacher incentives and

mentorship in science and mathematics pedagogies were missing. Besides, it showed that teachers did not have the requisite skills in special education to connect learner potential in science and mathematics, a situation that prompted government to take action in suggesting amends in teacher development and training. This brings in another perquisite; the need for appropriate skills in the teachers of special education.

Other studies done in South Africa (e.g. Maguvhe (2015), Mutanga and Walker (2017), Soobrayen (2013), respectively revealed that although access had improved for students with disabilities in this institution, there were still systemic barriers that limited the participation of students with VI in learning.

In a nutshell, the findings of these South African-based studies led to the conclusion that in developing countries [which Zambia is part of] there existed many obstacles in the process of implementing inclusive education. Gronlund *et al.* (2010) substantiate this in their study focusing on the effective use of assistive technologies for inclusive education in developing countries. In carrying out this study, an in-depth case study of two developing countries, Bangladesh and Tanzania, was reviewed. The findings revealed that barriers to effective use of assistive technologies for inclusive education emanated from three different levels, namely the national, school and network. It was, however, argued that they were only part of the equation for a country to achieve inclusive education; the scholars argue that a high-level national perspective was required since assistive technologies were just part of the problem. Indeed, the insights from this study reflect what is obtained in the current study at Sefula School in Zambia.

In shedding more light on access to curriculum for students with disabilities at higher learning institutions, Mosia and Phasha (2017) carried out research to prove inconsistencies between its practices and the students' admission in the institutions. This would guide decision-making about the appropriate development of learning and teaching resources, stimulate research on the success and retention rates of students with disabilities, and lead to the restructuring of programmes that are currently not easily accessed by learners with visual impairments (VI).

The Botswana Scenario

In Botswana, similar studies were conducted by Chhabra, Srivastava, and Srivastava (2010) that focused on identifying the concerns and attitudes of teachers towards the inclusion of students with disabilities in the regular classroom. The results revealed that teachers in the country had a kind of negative attitude towards inclusive education. It was further revealed that many ordinary teachers felt unprepared and were uncomfortable working with students with VI. As a result, they exhibited some frustration and anger towards inclusive learning because they were convinced this would lead to poor performance in terms of standards (Chhabra *et al.,* 2010).

The Case of Zimbabwe

Associated with *Distance Education* is yet another research carried out by Kaputa (2013), dubbed 'Making Open and Distance Learning Inclusive: The Zimbabwe Open University's (ZOU) Experiences of People with Disabilities'. Here, Kaputa (2013) found that only less than 1 per cent of students with VI had some inconsistency present at ZOU. This presents some inconsistency with the World Health Organisation, who contend that an estimated 15.6 per cent of the world population is composed of people with disabilities. However, learners with disabilities were confronted with challenges in accessing visual and hearing impairments instructional materials, where they resided.

Related to Kaputa's (2013) work is Mafa's (2012) work. Mafa contends that in Zimbabwe, inclusion has mostly been on the national agenda beginning the year 1994. Despite that far, criticism and contradiction still abound concerning the promotion of

inclusive education. This study highlights a lack of support and skill from teachers (*Ibid*).

Kaputa (2013) and Mafa (2012) did another study on the lived experiences of students with disabilities, focusing on the hearing-impaired (HI). The trio's findings revealed that students with disabilities in Zimbabwe continued to experience physical, attitudinal, and institutional barriers. The study also indicated that students developed coping strategies that made them reach their educational goals. The trio observes that self-advocacy skills are regarded as the most crucial aspects in determining the success of students with disabilities in Higher Education. Similarly, self-efficacy among the learners was considered a conduit to success. Nevertheless, Kaputa's (2013) study is criticised for advocating for improved policy improvement and affirmative action for students in inclusive settings at the expense of advocating for learners with disabilities to learn how to overcome countless disablers commonly found in many learning institutions.

Experiences in Uganda

In Uganda, Emong and Eron (2016) focused on disability inclusion in Uganda. The study reviewed that despite Uganda's robust disability legal and policy framework on education, there is evidence of exclusion and discrimination of students with disabilities in the HE institutions. The findings showed that there existed discrimination and exclusion tendencies in matters related to admissions, access to lectures, assessment and examinations, access to library services, halls of residence, and other disability support services. To this end, the study concluded that institutional policies and guidelines on support services for students with disabilities and special needs in HE be developed, data on students with disabilities collected to help with planning, and collaboration between Disabled People's Organisations (DPOs) strengthened as well (*Ibid*).

In East Africa, similar studies were carried out that focused on academic impediments students with VIs faced in higher institutions of learning. Major findings revealed that the school curriculum did not receive good share of support; learning resources were not available, and that the examinations were not adapted by the concerned institutions to suit the needs of learners with VI. Besides, staff development in inclusive education was still in its infancy. In addition, it was found that the majority of the students with VI had no white canes and were untrained in orientation and mobility (Emong and Eron's, 2016; Nasiforo, 2015).

In addition, Nasiforo's (2015), Majinge and Stilwell's (2014) conducted a study on Students with visual impairment in a different context. Majinge and Stilwell (2014) studied library services provision for people with visual impairments and in wheelchairs in academic libraries. The results show that academic libraries provide services to people with visual impairments and in wheelchairs, but these services are not inclusive or universal. Therefore, the study recommends that academic libraries strive to provide inclusive services to all users, including people with disabilities. Scholars suggested the need to ensure that new libraries constructed have ramps and maintain working lifts, Braille materials, and large print information resources, as well as providing assistive equipment (Majinge and Stilwell, 2014).

The Zambian Scenario

The findings of the study in Zambia are no different. Akakandelwa and Munsanje's (2011) study revealed that most learning institutions in Zambia did not provide adequate and suitable learning and teaching materials to pupils with VI. Besides, many schools did not have resource rooms for storage and use of learning and teaching materials for these pupils. Because of this, most children with VI appeared to perform poorly in their studies and were required to drop science and mathematics subjects due to a lack of teaching and learning materials (Akakandelwa and Munsanje, 2011; Nasiforo 2015)). This particular observation raises a

concern similar to the one the current study raises.

The reported inappropriate learning and teaching materials to pupils with VI compounded by public buildings' lack of ramps, handrails, elevators, user-friendly restrooms, and other facilities necessary for persons with disabilities to use buildings came out as findings come in other countries as well (Chilufya, 2013). Consequently, the prevailing conditions resulted in dehumanising practical challenges in most cases when making use of the services offered in public buildings. This restricted their enjoyment of the rights to independent living, inclusion in society, and equality of opportunity (Ndhlovu, 2009).

Issues of Inclusive education in Zambia were echoed by other researchers such as Banda-Chalwe, Nitz, and De Jonge (2013). Banda-Chalwe *et al.* (2013) focused on mobility limitations. Their research indicated that lack of access to institutions, public spaces and workplaces had resulted in reduced participation with negative implications for personal, family, social, and economic aspects of the lives of the learners. Issues of transportation, government and service buildings emerged from the findings (Banda-Chalwe *et al.* 2013). A similar study that has been conducted by Muwana (2012) in Zambia on the Zambian trainee teachers', whose research study focused on the Zambian student teachers' attitudes towards including students with disabilities, reveals that University of Zambia students embrace positive attitudes towards inclusion. Nevertheless, trainee teachers believed that the implementation of inclusion was delayed by the government's lack of adequate resources and support from the government.

However, as echoed by Simui *et al.* (2018), it should be noted that Muwana's (2012) research approach was driven by a quantitative methodology with over-reliance on a questionnaire research tool remotely administered to the Zambian trainee teachers. In addition, the study did not focus exclusively on learners with Visual Impairments.

Literature Gap

Based on the reviewed literature from most Southern African countries (of which Zambia is part) on the experiences of learners with special educational needs in general, there seems to be lack of the latest Zambian-based literature directly speaking to such interventions as the application of alternative assistive technologies that incorporate various digital tools and resources to ameliorate the challenges visually impaired learners, in particular, face in learning mathematics. Existing research has highlighted the potential of assistive technologies to enhance mathematics education for visually impaired learners globally (Gronlund, Lim, & Larsson, 2010; McKenzie, 2015). However, there is a dearth of research on the specific needs and contexts of visually impaired learners in Zambia, particularly regarding the use of assistive technologies in mathematics education. This knowledge gap underscores the need for context-specific research to inform the development and implementation of effective assistive technologies that cater to the unique needs of visually impaired learners in Zambia. As at present, there seem to be no research conducted locally on assistive devices for the VI. The current study has attempted to bridge this gap.

METHODOLOGY

The current study was carried out at Sefula School for the Visually Impaired in Mongu District, Western Province of Zambia. It used a Case Study Design, which is essentially an in-depth examination and analysis of a specific situation or opinion. The qualitative approach was used to collect primary data. In applying a qualitative strategy, the researchers had an opportunity to record and understand the participants' subjective views, opinions, behaviour and attitudes (Mkandawire, 2019). The sample population comprised 11 participants: 8 Senior Secondary School learners with visual

impairment and 3 teachers of mathematics, teaching learners with visual impairment in an inclusive classroom. The participants were selected using purposive sampling. The eleven were selected using their experience and their ability to provide rich and relevant data to the research. Primary data were collected using qualitative methods that included in-depth interviews and focus group discussions (FGD) where Open-ended and semi-structured interview guides were utilised as instruments of data collection. The in-depth interviews involved interviewing 3 teachers of mathematics from an inclusive classroom. As a way of getting the learners' perspectives and verifying the data collected through in-depth interviews, a Focus Group Discussion was also conducted involving 11 learners with visual impairments. To mitigate the limitation of a small sample, such as statistical power and precision, representativeness and generalizability, as well as increased risk of bias, researchers used data from multiple sources to complement the primary sources. The data were then analysed thematically, and emerging themes and sub-themes constitute the findings and discussion section of this article.

ETHICAL CONSIDERATIONS

The study carefully observed and adhered to ethical precepts such as informed consent, confidentiality, and anonymity at all stages to build trust and confidence among respondents and participants (Kumar & Mandhar, 2020; Kang, 2023). Three ethical considerations, namely 'informed Consent', 'voluntary participation', and 'respect for privacy', were applied.

Informed consent: Consent for the Visually Impaired learners to participate in the study was sought from the authorities at Sefula School while the proposal for the study was cleared of any human subjects' rights infringement by the Research Ethics Committee from Kwame Nkrumah University. Researchers ensured that participants (and their guardians) understood the study's purpose and benefits.

Voluntary participation was sought to ensure that participants were not coerced or pressured into the study. Respect for privacy was also sought to maintain confidentiality and protect participants' information. The participants agreed to be interviewed on condition that their identity (in terms of their names) was not disclosed.

FINDINGS AND DISCUSSION

The study embarked on determining how the disablers affected the teaching and learning of mathematics to learners with visual impairment in an inclusive classroom. The findings of the study indicated that there were disablers in the teaching of mathematics to visually impaired learners at Sefula School, and both the individual participants during interviews and the discussants in the FGDs cited the disabler: *Lack of resource material, lack of access to ICT, Lack of trained Special Education teachers to teach mathematics, negative retorts from teachers towards the learning and teaching of mathematics to learners with visual impairment in an inclusive classroom, and lack of resource materials such as braille teaching and learning aids.*

Lack of Resource Material

The inadequate resource material came out from participants as one critical disabler to the teaching of mathematics. This included a lack of braille teaching and learning aids. One teacher, for instance, recounted:

> *There are no senior secondary school books in Braille which learners can use for reference when they are studying alone or with their friends, so learners depend entirely on the content given in class only. It is so demotivating for me as a teacher and it affects the learners with visual impairment performance in an inclusive classroom (*Interview with a Senior

> Teacher, Sefula School, January 8, 2024*).*

Participants lamented the scarcity of teaching aids in the context of the above verbatim. They observed that, as a result, it was difficult for them to plan for mathematics lessons for learners with visual impairment, in the absence of specific mathematics books for learners with visual impairment in their school. The problem of resource material, they observed, resulted in poor lesson delivery in an inclusive classroom.

Learners in a focus group discussion (FGD) made observations consistent with those from their teachers. One noted:

> *There are no mathematics books or pamphlets in braille so I entirely depend on examples and exercises given in an inclusive classroom which is very demotivating. This problem limits my knowledge and affects my academic performance in mathematics tests. This limits my knowledge of mathematics. My performance in mathematics is average because of this limit* (Focus Group Discussion, January 9, 2024*).*

Learners with visual impairment expressed resentment at the way they had been treated in the learning process. The absence of the taught content in the braille content, which was otherwise availed to ordinary learning in inclusive classes simply meant neglecting them. During their engagement with the researcher during the FGD, affected learning reported a loss of interest in learning mathematics. For instance, one narrated:

> *I have lost interest in learning mathematics because it seems mathematics is for the learners who are sighted and not us. This is because, in our inclusive classroom arrangement, the teacher of mathematics* concentrates more on learners who are sighted at the expense of us the visually impaired (Focus Group Discussion, January 9, 2024)

During the Focus Group Discussion, it was heard that some visually impaired learners felt bad about themselves after failing a mathematics test in an inclusive classroom. They attributed the cause for their failure in the subject to the segregation by their subject teachers, alleging that the mathematics made it appear like it was for the sighted, and not for them.

The need to provide learning tailored to the learner's needs cannot be overemphasised. This idea is supported by Mbofana *et al* (2022) who stress that there is a need to craft a mathematics curriculum which suits the needs of the LVI. This, however, does not imply that such a curriculum should differ from the ordinary curriculum for learners without VI. Sometimes this simply calls for the application of initiatives and innovation on the side of the teacher. In the case of Sefula school for the VI, the teachers could overcome the disablers faced by learners with visual impairment in the mainstream classroom by doing the following; modification of lessons, coming up with a curriculum which meets the needs of learners with visual impairment, using inclusive teaching methods, soliciting support from teachers who are visually impaired and using technology such as computers and talking calculators in an inclusive classroom.

The Lack of Access to ICT

Among the disablers cited by participants was the limited availability and utilisation of ICT both among the students and teachers of Special Education at Sefula. During the interview, Mr. Kwabula (*pseudonym*), a mathematics teacher at Sefula School for the Visually Impaired narrated thus:

> *Teachers teaching mathematics to learners with visual impairments should try all means to incorporate technology when delivering lessons in class. Technology such as talking calculators and computers or laptops with the jaws software on it can be of great help to teaching mathematics to learners with visual impairment*. But the great challenge we have here is the non-availability of these technologies (Interview with a Class Teacher, Sefula School, January 8, 2024*).*

The case at Sefula could have been exacerbated by the problem of a lack of libraries and Inadequate or non-availability of relevant Information resources in most rural libraries in Zambia. Writing on the problems of poor reading culture and the problem of access to information resources and services by Students and teachers in rural schools in Zambia, Hachintu (2023) observed that the root causes of the problem were the unfamiliarity with the library functionality, mostly due to the poor background in reading culture. He expressed concern about the death of libraries in remote rural communities and worried that where these libraries exist, they did not play their expected role.

In other related studies on the implementation of approaches to the teaching of Religious Education (RE) in the Chivuna rural community in Zambia, authors highlighted the lack of access to ICT and the problem it caused to rural learners by limiting their exposure to learning resources via technology, causing them to miss out on what would have reinforced the knowledge they gained from the classroom (Khonje and Hachintu, 2023; Hachintu and Khonje, 2023).

Many scholars have written on the subject of ICT in Special Education with a broad focus on how Technology has quickly taken over many aspects of the learners' daily lives. For children with learning disabilities, she argues that assistive technologies have changed the game by giving them fresh cutting-edge ways to access information, communicate and learn. Jennifer Hanson observes:

> *ICT in special education is becoming increasingly crucial to support children with exceptional needs. It helps improve learning results, communication, and independence for students with disabilities by giving them access to new and creative tools (*Hanson, 2024).

In this way, ICT brings in the advantage of levelling the playing field for children with Special Education needs. This is made possible by incorporating into the learning environment what is referred to as the ICT classroom. The study discovered that even when the school had the ICT classroom that used information and communication technology (ICT) as a key component of teaching and learning, with various digital tools and resources used to enhance learning and communication which ideally were to be found in this set-up, this was not the case for visually impaired children.

Among the other benefits of ICT is the introduction of the Individualised Education Programme. Through this innovation, assistive technology brings in the aspect of enhancing the ability of the learner to individualise the education process. Learners with additional educational needs can use digital resources and tools suited to their needs, such as text-to-speech software, which can help them better comprehend and remember information (Hanson, 2024).

ICT in special education also has the important benefit of enhancing social and communication skills. For instance, pupils unable to communicate orally can express

themselves more clearly using alternative and augmentative communication (AAC) tools, including voice output communication aids and dynamic displays. This can boost their self-esteem and confidence while expanding their social engagement and integration prospects *(Ibid).*

Furthermore, the benefit of ICT was the introduction of Augmentative and Alternative Communication. This tool enhances the capacity of the learner to participate in group activities and work with their classmates. Those learners who struggle to express themselves vocally find an advantage in benefiting immensely from this alternative digital tool.

Teaching Mathematics to Visually Impaired Learners using the AAC Tools

Several scholars (among them Spungen, 2013; McKenzie, 2015; Whitney, 2017) have made significant contributions to the field of augmentative and alternative communication (AAC) and teaching mathematics to visually impaired learners. The augmentative and alternative communication digital tools can be adapted for teaching mathematics to visually impaired learners. They assert that AAC tools, such as text-to-speech software, speech-generating devices, and braille displays, can help facilitate mathematical learning, such in the following ways:

i. ***Tactile Graphics:*** These utilise braille displays or tactile graphics software to create raised-line drawings, allowing students to explore mathematical concepts through touch.

ii. **Audio Representations:** Use audio to convey mathematical concepts, such as geometry and graphs, which are often visually oriented.

iii. ***Multisensory Approaches:*** These combine AAC tools with hands-on materials, such as manipulatives, to create a multisensory learning experience.

iv. ***Math Notation Software*:** This is the leverage software that converts mathematical notations into braille or speech output, enabling students to read and write math equations.

v. ***Interactive Simulations:*** Adapt interactive math simulations to provide audio to tactile feedback, enabling students to explore mathematical concepts engagingly and interactively.

By incorporating AAC digital tools, the scholar cited above collectively contends that educators can create a more inclusive and accessible mathematics learning environment for visually impaired learners.

Teachers' Negative Attitude towards Learners with Visual Impairment

Maltreatment by teachers was cited by participants as another disabler to learning mathematics in an inclusive classroom. This resulted in most learners with visual impairment getting mentally defeated when it comes to learning mathematics because of the negative statements regarding the learning of mathematics from some teachers. One participant recounted:

> *For negative comments from teachers with visual impairment who discourage learners with a visual impairment from taking mathematics, teachers should be sensitive to the importance and benefits of learning to teach mathematics to learners with visual impairment. Further added that the government should come up with a curriculum specifically made for learners with visual impairments to promote uniformity in the teaching and learning of mathematics to learners with visual impairments* (Focus Group Discussion, January 9, 2024).

Inflexible Teaching Methods and Rigid Assessment Methods

The negative attitudes of teachers made the learning of mathematics difficult as teachers could not modify teaching methods to suit the needs of the learner citing time constraint and syllabus coverage. The study indicated that teachers were not ready to deliver lessons using inclusive teaching methods. Assessments tools were rigid and were inconsiderate of the needs of the learners. The study also revealed that there no deliberate efforts to promote equitable evaluation practices that consider the unique needs and strengths of visually impaired learners

Lack of Trained Special Education Teachers

The lack of trained teachers in Special Education was among the disablers to teaching mathematics to the visually impaired, cited by participants. One teacher narrated:

> *I do not have sufficient training in teaching mathematics to learners with visual impairment, so learners are always lagging, and this affects their academic performance in an inclusive classroom. On my side, it is draining and frustrating because I have to teach learners I was not trained to handle. The visually impaired demand a lot of attention, and I cannot just cope with that* (Focus Group Discussion, January 9, 2024).

Learner Participants in the Focus Group Discussion unanimously attested to the prevalence of untrained teachers in mathematics.

The above observations by participants on the lack of trained staff in special education are an echo of what Mbofana *et al.* (2022) hold in their contention that there is a need to train mathematics teachers to equip them with relevant skills to handle LVI. Training programmes which integrate LVI, they argue, must be available in all teacher education programmes at all levels of training. Maguvhe (2015) also discovered that mathematics and science teachers need to attend regular staff development workshops covering selected topics in mathematics, science and accommodation suitable for blind and partially sighted learners.

The Need to Have Trained Specialist Teachers at Sefula

From the foregoing, we can see the necessity of integrating ICT in special education and having the teachers use technology and incorporate it into their lessons. To help students overcome obstacles (such as the disabilities in learning mathematics cited in the current study), it is also crucial to ensure they have access to the proper assistive technology and support.

Coming to the case of Sefula School for the Visually Impaired in Zambia where the challenge of the disablers to teaching and learning mathematics present themselves in the current digital era, AAC digital tools, if incorporated, would be one option to take along with the deployment of trained specialist teacher to the school, which the current study would suggest. By the need to train specialist teachers, we imply teachers adequately trained in ICT, particularly in the various technological tools required in the management of the Inclusive Education ICT Classroom.

Even though the current study seems to be much broader in scope, encompassing a wider array of issues constituting the challenges faced by learners with a disability, it provides relevant nuances useful in the assessment of the case of Sefula in the current study.

The Impact of ICTs on Education Delivery

Related to e-learning is the need for access to Information Communication Technology (henceforth referred to as (ICT).

In their study on the impact of information technologies (henceforth called ICTs) on learning and service delivery at Kwame

Nkrumah University in Zambia, Mumba and Hachintu (2017) observed that Information Communication Technologies (ICTs) have an impact on learning and service delivery through the utilisation of various forms of ICTs. PANOS (2010) identifies support services to education that can be directly linked to ICTs such as tutorials, e-library, guidance and counselling, and academic consultations, that could be accessed online and via SMS. However, Lundu (1998) observes that some remote rural areas do not benefit from this service due to the non-availability of computer libraries or resource centres. Therefore, people do not have access to information. Events (1998), therefore, suggest that access to Information using ICTs is dependent on its availability.

Though the ICTs availability at Seful`a School for the blind did not constitute the central focus of the study, responses from the participants in the current study seemed to suggest that if ICTs were made available, some of the challenges to teaching mathematics to learners with visual impairment that resulted due to the disablers would have been easily solved by using the latest technology.

Theory and Findings: The Nexus

There is a connection between the Social Model theory and the findings on the disablers of teaching mathematics to Visually Impaired learners at Sefula School for the Visually Impaired in Zambia. The theory posits that society's structures, norms and institutions can either enable or disable individuals, particularly those with impairments and that under this model, a person who has an impairment is disabled not only because of the impairment but also because of the attitudes of society and poorly constructed physical and social environments. The findings of the current study are consistent with the theory, in the sense that it is the deprivation of the 'enablers' in the learning media and inclusive learning environment at Sefula that caused challenges in the teaching of mathematics to learners with disabilities in an inclusive education set up.

CONCLUSION

In conclusion, this study was aimed at identifying the disablers of teaching and learning Mathematics among Senior Secondary School learners with visual impairment in an inclusive classroom at Sefula Special School, Zambia. The disablers, both in teaching and learning the subject in an inclusive learning environment at Sefula, were established. These included inadequate teaching and learning resource material, teachers' negative attitude towards the visually impaired learning mathematics, and the challenge of access to ICT and the lack of trained Special Education teachers. The study further determined how these barriers to teaching and learning of mathematics affected the teaching and learning in the concerned subject by the concerned teachers and learners at the school. For instance, the scarcity of basic teaching and learning resources, such as braille and teaching aids, made it difficult for teachers to plan for mathematics lessons for learners with visual impairment.

Teachers' negative attitude towards learners with visual impairment resulted in most learners with visual impairment getting mentally defeated when it came to learning mathematics while the lack of or poor access to ICT failed to access various technological tools, such as computers, laptops, tablets, interactive whiteboards, speech recognition software, text-to-speech synthesizers, and aids and alternate means of communication, which are critical aspects of assistive technologies necessary in designing a dynamic wide range of alternative digital resources in teaching mathematics. The lack of trained teachers resulted in failing to integrate ICT in special education thereby making teachers fail to appreciate the use of assistive technologies, especially in how to incorporate them into their lessons.

These findings were consistent with the Social Model theory (SMT) applied in the study to guide the investigation, which posits that society's structures, norms and institutions

can either enable or disable individuals, particularly those with disabilities.

RECOMMENDATIONS

Based on the findings of the study, the authors make the following recommendations. The government, through the Ministry of Education should:

a) Ensure that trained specialised teachers are deployed to schools where the service is needed.

b) Enhance continued teacher professional development through planned CPDS by TCZ to equip teachers with inclusive teaching methodologies so as to enhance teacher preparedness to deliver inclusive lessons to meet the diverse needs of learners.

c) Invest more in producing mathematics learning materials for learners with visual impairment.

d) Expedite the formulation of the Inclusive Education Policy to guide the effective implementation of Inclusive Education equitably.

e) Include ICT in the curriculum for learners with visual impairment to impart skills in the use of various digital tools and resources to enhance learning and communication in an inclusive education environment.

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