
BARRIERS TO THE INCLUSION OF LEARNERS WITH HEARING IMPAIRMENTS: A REVIEW OF LITERATURE ON ZAMBIA

BARREIRAS PARA A INCLUSÃO DE ALUNOS COM DEFICIÊNCIAS AUDITIVAS: UMA REVISÃO DA LITERATURA SOBRE A ZÂMBIA

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Abstract: Teaching learners with hearing impairments in inclusive learning environment require identification and elimination of learning barriers. The current education policy in Zambia, 'Educating our future' of 1996 stresses the need to teach learners with disabilities inclusively. Effective inclusion of learners with hearing impairments entails identification of their learning barriers and making the learning environment accommodative. This paper is a literature review of some barriers that learners with hearing impairments experience in learning in inclusive learning environments and some accommodative measures to consider when teaching learners with hearing impairments. In this article we shall first explore the concept of hearing impairment and inclusive education from a historical perspective and thereafter explore the barriers that learners with hearing impairments experience in learning and review some accommodative measures for learners with hearing impairments in inclusive environments.

Keywords: Barriers. Deaf. Hearing Impairment. Inclusive Education. Learners.

Resumo: O ensino de alunos com deficiências auditivas em ambiente de aprendizagem inclusiva requer identificação e eliminação de barreiras de aprendizagem. A atual política educacional em Zâmbia, "Educando nosso futuro" de 1996, enfatiza a necessidade de ensinar os alunos com deficiências, inclusive. A inclusão efetiva de alunos com deficiências auditivas implica na identificação de suas barreiras de aprendizagem e na acomodação do ambiente de aprendizagem. Este documento é uma revisão da literatura sobre algumas barreiras que os alunos com deficiências auditivas experimentam na aprendizagem em ambientes de aprendizagem inclusivos e algumas medidas acomodatórias a serem consideradas ao ensinar alunos com deficiências auditivas. Neste artigo exploraremos primeiro o conceito de deficiência auditiva e educação inclusiva a partir de uma perspectiva histórica e depois exploraremos as barreiras que os alunos com deficiências auditivas experimentam na aprendizagem e revisaremos algumas medidas acomodatórias para alunos com deficiências auditivas em ambientes inclusivos.

Palavras-chave: Obstáculos. Surdo. Deficiência Auditiva. Educação Inclusiva. Alunos.

INTRODUCTION

Integrated science involves presentation of general scientific concepts together with demonstrations of how different disciplines interact with scientific concepts (Åström, 2008). The scientific concepts may be studied by learners from Chemistry, Physics and Biological perspectives at different school levels, to ensure that learning occur in a ‘Science Context’ environment (Åström, 2008), which promotes learning through problem solving and projects. Integrated science is one of the Core curriculum subjects in Zambia. Levander & Mikkola (2009) note that, Core curriculum courses are meant to be taught to all students or courses that are common, rather than what is essential to a particular programme. From the Zambian education policy perspective, the learning environment should be inclusive (Ministry of Education, 1996; MESVTEE, 2013, Muzata, 2021). Learners with impairments and/or disabilities should be free to participate fully in the learning environment without any discrimination. The education policy of 1996 ‘*Educating our Future*’, Education Act of 2011; Persons with Disability Act, 2012 and the National Disability Policy of 2015 support inclusive education in Zambia (MoE, 1996; Ministry of Community Development Mother and Child Health; 2015) implying that policies are in line with sustainable development goal number 4 on inclusiveness, equity, and lifelong learning. However, with reference to inclusive learning, studies have shown that learners with hearing impairments experience barriers in their learning (Crume, Moran & Shiekh , 2001; Powers, 2002 Wallang, 2016; Kumatongo & Muzata, 2021). In this article, we shall therefore explore the concept of hearing impairment and inclusive education from a historical perspective, the barriers that learners with hearing impairments experience in learning integrated science and review some accommodative measures to consider when teaching science to learners with hearing impairments.

LITERATURE REVIEW

Concept of hearing impairment

Hearing impairment is characterised by an individual’s inability to hear and interpret sounds due to problems in the auditory system. Although the term *deafness* is often used in

reference to severe hearing impairment in which an individual is unable to process linguistic information through hearing (WHO, 2015) with or without amplification, the Individuals with Disabilities Education Act of 2004 defines deafness as hearing loss that is so severe such that a child's difficulty in processing linguistic information through hearing (with or without amplification) adversely affects his or her educational performance (IDEA, 2004).

Hearing loss can be described in terms of onset, or the period of occurrence of hearing loss in the process of the development of speech. Pre-lingual hearing loss is used in reference to hearing lost before development of speech or prior to the development of spoken or sign language (Liversidge, 2003; Moores, 1996) and maybe congenital or acquired in the early stages of child development. All congenital (present at birth) hearing loss is pre-lingual, but not all pre-lingual hearing loss is congenital. Post-lingual hearing impairment is hearing loss that occurs after an individual has developed speech and language skills (Liversidge, 2003). Post-lingually hearing impaired individuals often face a period of progressive hearing deterioration from moderate to profound deafness (Lazard, Innes-Brown & Barone, 2014).

The severity of a hearing impairment can be measured using audiometer in decibels (dB) and categorised into; *mild*, *moderate*, *severe* and *profound* (WHO, 2015; Kigotho, 2016). Individuals with mild hearing impairment can hear sound between 25 and 40 dB, whereas moderate hearing loss is between 40 and 70 dB. In cases of severe hearing impairment, sound that is between 70 and 95 dB can be heard, whereas profound hearing impairment is 95 dB and over (WHO, 2015). Based on the severity of hearing loss, the term *Hard of Hearing* is used to refer to individuals with residual hearing loss, whereas *deafness* often used in reference to persons with severe hearing loss. In this article, hearing impairment and deafness are interchangeably used.

HISTORY OF INCLUSIVE EDUCATION

Era of exclusion (extermination & abandonment)

Despite the Salamanca Statement on inclusive education terming it as “*schools for all*” (United Nations, 2014, UNESCO, 1994), Inclusive education was not ‘inclusive’ from its historical perspective. During the *Era of exclusion (extermination & abandonment)*, which is the

earliest era in the history of inclusive education (Mangal, 2012; Tremblay,2007), persons with disabilities, where subjected to treatment that aimed at excluding them from societies, in that the era was dominated by the philosophy of exclusion, that is doing away with the disabled from birth by means of horrified measures such as killing, mutilating or burning. During this era, disability was regarded as punishment from gods or as a sign of evil and parents had rights to terminate lives of their children, for instance children with disabilities could be left chained in the forest and left to die (Tremblay,2007; Muzata,2021).

Era of acceptance as a subject of amusement

The era of acceptance as a subject of amusement or using the disabled as slaves marked the second era in the history of inclusive education and is sometimes referred to as the *era of ridicule*, due to the persons with disabilities who were used as slaves, or making them objects of amusements at home, circus or public places(Tremblay,2007). Dwarfs were used as clowns (comic entertainers) due to the nature of their physical stature.

Era of legal discrimination & witchcraft

The era of legal discrimination & witchcraft which occurred during the medieval period (5th to 15th century), was characterised by persons with disabilities being discriminated in the name of religious sanctity (Mangal, 2012; Tremblay, 2007) in that persons with disabilities could not approach sacred places because they were labelled impure and Churches made discriminatory laws depriving disabled from inheritance and other privileges as citizens as well as suspected of practising witchcraft and tortured.

Era of sympathy and asylum

The era of sympathy and asylum was characterised by the perception that persons with disabilities being institutionalised based on the pretext of providing care and rehabilitation to persons with disabilities in isolation, in that people attached pity to the disabled. Institutionalisation of persons with disabilities was also used as a way of protecting non disabled people from harm or defects. The period was also characterised by asylum for the disabled and probably indirect sterilisation (Mangal, 2012). Kisanji (1999) writes that asylums were not meant

for educational purposes, but for custodial and treatment purposes for persons with physical and intellectual impairments.

Era of isolated setting (Special education)

The era of isolated setting occurred during the renaissance movement in the 17th century (Tremblay, 2007) but brought hope to persons with disabilities because it was during this period that schools were established in isolation (Mangal, 2012), implying that schools for persons with disabilities were segregated from the mainstream settings in the 18th century. During this era, individuals as Jean Marc Itard (1774-1838) who taught Victor the wild boy and pioneers of special education such as Maria Montesson; Edward Seguin and Ovide Decroly took a leading role in the education of learners with disabilities (Tremblay, 2007).

The *era of Segregation setting* (special classes in regular schools) occurred during the 20th century, and Special classes for children with disabilities were also established within the main stream and learners with disabilities were also admitted without consideration of their severity of disability, implying that educationists were not considering the degree of one's impairment.

The *era of inclusion setting* (Regular schools) which is regarded as the modern era in which all learners, with or without disabilities can learn together in the same learning environment (Mangal, 2012; Tremblay, 2007; Kisanji, 1999).

Concept of inclusive education in modern era

Inclusive education in the modern era thus is a learning environment which includes every learner, celebrate differences, support learning, and respond to individual needs (UNESCO, 1994; United Nations, 2014). From inclusive education perspective, the four principles of inclusion, sometimes referred to as the *4A's scheme* (Pekeberg, 2012) have to be observed, these include; *accessibility, availability, acceptability* and *adaptability* (United Nations, 2014), implying that learning institutions have the obligation to make education *accessible, available, acceptable and adaptable* for all learners. Accessibility forms the basis for precondition to a full realisation of the rights and inclusion of persons with disabilities in society (UN, 2014), and a fundamental right because it serves as a gateway to other rights (Greco, 2016).

Accessibility entails a must accessible educational institution and programmes to persons with disabilities, without discrimination and Article 9 of the CRPD on accessibility reflects three overlapping dimensions; *non-discrimination* and *reasonable accommodation*, *physical access* and *economic access* (UN,2014) of which Non-discrimination and reasonable accommodation entails education that is accessible to all persons, including the most vulnerable persons with disabilities. *Availability* implies that functioning educational institutions and programmes for learners with disabilities must be available in sufficient quantity within the jurisdiction ((UNESCO, 1994; UN, 2014). Learners with disabilities should therefore not be subjected to travelling long distances in order to access education.

The concept of *acceptability* entails providing a welcoming hand to every learner in every learning institution. The right of persons with disabilities to receive education in mainstream schools is included in article 24, paragraph 2 (a), of the Convention on the Rights of Persons with Disabilities (CRPD) which stresses emphasis on no rejection of learners from general education on the basis of disability (Persons with Disability Act, 2012; UN, 2013), but rather providing alternative modes of communication and reasonable accommodation for learners. Learning institutions should ensure that Inclusiveness is highly prioritised over segregation of learners with disabilities if acceptability is to be adhered. Appropriate language and modes of communication must be provided or used for learners with communication problems, whereas Braille related materials for learning purposes must be made available to learners with visual impairments.

The concept of *Adaptability* in inclusive education refers to flexibility to meet the needs of learners with disabilities (UN, 2014) and should include; provisions of *reasonable accommodation* and providing *support* to learners to facilitate their learning within the general education system. Responsiveness to the changing nature of education depict elements of adaptability and this can be in form of recruiting teachers with disabilities (UN, 2014) and teachers qualified to handle learners with diverse needs in order to provide quality inclusive learning.

BARRIERS TO LEARNING BY LEARNERS WITH HEARING IMPAIRMENTS IN INCLUSIVE CLASSES

Hearing with hearing impairments tend to experience challenges when learning in inclusive environments. Communication challenges (Wallang, 2016; Kumatongo & Muzata, 2021a; Mandyata & Kamukwamba, 2018), lack of appropriate learning resources (Ndonyo, Matafwali & Chakulimba, 2017) and challenges to understand concepts taught (Kumatongo & Muzata, 2021b; Kumatongo & Musukwa, 2020).

Communication is one of the barriers to learning science by learners with hearing impairments. Individuals with profound or total deafness may not be exposed to spoken language (Wallang, 2016) and the main barrier in Deaf pedagogy is the inability of hearing people to understand a language of a different modality. Most educators fail to understand that language can function beyond speech modalities (Wallang, 2016). Successful inclusion for learners with hearing impairments requires an effective communicative environment with access to formal curriculum which has flexible assessments and teachers possessing required skills and positive attitude to teach the learners (Powers, 2002; Wallang, 2016). In most cases, sign language interpreters are used to bridge the gap between deaf students and teachers (Martins, 2006). Lack of sign language interpreters and limited vocabulary among deaf learners (Muzata & Mahlo, 2019) create learning barriers for deaf students in inclusive learning environments in that deaf students are likely to incurred challenges in terms of delays in receiving information, that is the time between what is spoken and translation of information; assimilating what the teacher is writing on the board and interpreters translation; a break in eye contact when teachers face the board to write on the board, walks across the room or when reading a document can prevent students who lip read (Foster et al., 1999; Sobel & Hill, 1999). In relation to learning science, the act of observing a teacher demonstrating how to handle and manipulate objects in the lab or images and looking at the interpreter for clarity of information(Foster et al.,1999) can present learning challenges leading to failure to grasp appropriate concepts by deaf students.

Understanding *concepts* during lessons is also one of the challenges faced by learners with hearing impairments in inclusive learning environments (Kumatongo & Muzata, 2021b; Kumatongo & Musukwa, 2020). A study by Kumatongo & Musukwa(2020) revealed that student teachers with hearing impairments had challenges comprehending scientific terms due to lack of

word-signs to represent most of the scientific terms. Word-signs help to create a mental picture of a particular word. Lack of word-signs for scientific terminologies can create a learning barrier in that learners with hearing impairments may fail to make sense out information presented to them in abstract form or via fingerspelling without a visual representation.

Rapid pacing of students with hearing impairments to cover the syllabus can affect their learning. Crume, Moran & Shiekh (2001) found that pressure exerted on teachers of learners with hearing impairment by education officials to ensure that educators keep pace with the curriculum and syllabus by teaching rapidly at the expense of learners with hearing impairments created learning barrier, in that learners had challenges to learn at a rapid pace due to different learning abilities. Namukoa(2014) states that learners with hearing impairments enter learning institutions with limited background knowledge, hence the need to promote differentiated learning to support their learning.

Insufficient resources both human and material (Ndonyo, Matafwali & Chakulimba, 2017; Manchishi, 2015; Muzata, 2013) have also been found to create learning barriers to students with hearing impairments in Zambian schools. Ndonyo et al.(2017) found that the use of unsuitable materials to teach learners with hearing impairments affected their learning and use of unqualified personnel (Banja & Mandyata, 2018; Ndonyo et al., 2017) was also reported to affect the education of learners with hearing impairments. Implying that learners with hearing impairments require appropriate learning resources and qualified educators to teach them and understand their diverse educational needs.

Challenges with standardised assessments

Exposing learners with hearing impairments to same assessment items with their hearing peers despite learning together in an inclusive can affect their academic performance. Studies have shown that learners with hearing impairments face challenges when writing standardised assessments (Manchishi, 2015; Chifinda, 2017; Muzata, 2015). It is therefore cardinal to ensure that the needs, strengths and weaknesses of learners with hearing impairments are considered when assessing learners inclusively.

ACCOMMODATIVE MEASURES TO CONSIDER WHEN TEACHING SCIENCE TO LEARNERS WITH HEARING IMPAIRMENTS

Use of visual objects

Science of education is a systematic body of knowledge that deals with quantitative and objective aspects of the learning process, in which precision instructions are employed when submitting the hypothesis of education to the test of experience, usually in form of experimentation (Prakash, 2015). Science lessons for students with hearing impairments should occur in a learning environment that is *rich with visual organisers* and centered on content vocabulary development (Graham, 2012), it should be a place for students to engage in experimentation with multiple tools that include technology and other science tasks that promote hands-on and minds-on, authentic, and problem solving oriented learning. This kind of environment promotes active learning and critical thinking among learners. The use of visual objects is cardinal in the education of learners with hearing impairments in that they use sight to learn.

In relation to *visualisation science*, Skyer(2016) writes that visualisation sciences strongly suggest that deaf students learn well with images. Educators of deaf students in a study by Graham (2012) indicated that visual images should be considered when handling the deaf. Visual representations, tactile experiences, incorporating concrete ideas and examples in instruction that are meaningful and authentic to students are inevitable in that deaf students are “*visual learners*” whose comprehension of scientific ideas depend on seeing things. The learners tend to grasp ideas better when they see and manipulate objects than abstract objects that they cannot visualise (Graham, 2012). Deaf students can benefit from visual aids such as videos, posters, Smart Boards, iPads, projectors and demonstrations (Schultz, Lieberman, Ellis & Hilgenbrinck, 2013; Kigotho, 2016) in that appropriate use of visual aids provide best ways of conveying information and instruction to deaf students.

Assistive technology and internet services

Assistive technology and internet services can be useful in teaching science to deaf students. Drigas, Kouremenos, Kouremenos & Vrettaros(2005) state that the World Wide Web Consortium (W3C) drew useful information to do with the creation of accessible html pages for

learners with hearing impairments, which can be used by teachers for any time-based multimedia presentation, synchronise equivalent alternatives with the presentation in that any form of multimedia, such as a movie, animation or slide show as well as equivalent alternatives to these types of presentations are captions which provide access to audio tracks and audio descriptions provide access to visual tracks (Drigas et al.,2005) which can help to facilitate the deaf grasp scientific concepts. Deaf students may also experience difficulties to assimilate what the teacher is writing on the board and the interpreter's translation at the same time (Sobel & Hill, 1999), hence the need to provide a ready copy of notes and thereafter deaf students can then generate their own class notes outlining their personal interpretation of the salient details (Sobel & Hill, 1999).

The use of multimedia

The use of multimedia when teaching students with hearing impairments has been proven to yield positive results (Lee &Kamisah, 2014; Saowalak,2015), in that learners were found to participate actively during science lessons (Lee &Kamisah, 2014)and demonstrated understanding of scientific processes (Saowalak,2015). Chatwirakom(2018) suggested that hearing impaired students should be allowed to practice more to be good at teaching science and feel confident to teach in class. The use of multimedia when teaching deaf students may therefore promote more practice in science when teaching deaf students. Kumatongo(2019) notes that using Multisensory approach; abbreviated as 'VAKT' in reference to 'Visual-Auditory-Kinesthetic-Tactile', which is a learning approach that promotes presentation of information in different modalities can enable learners to see, hear, touch and manipulate objects, thus likely to promote effective learning. Learners with hearing impairments may not benefits from information provided via auditory in this context, but the visual, kinesthetic and tactile can help them generate understanding of scientific concepts.

Educators handling deaf students in science subjects should use practices that promote active learning. Strategies that involve the use of approaches that are learner centered and likely to maximise lively student engagement in learning process (Namukoa, 2014) such as activities that promote hands-on, discovery learning, inquiry learning as well as experiential learning as

well as helping learners take control of their learning, and allow learners to learn together (Richardson, Marschark, Sarchet, & Sapere, 2010; Bransford & Donovan, 2005). The use of pedagogical strategies that promote passive, rote-oriented learning and that focus on basic skills and the memorisation of disconnected facts (Namukoa, 2014) should be discouraged when handling students with hearing impairments.

Understanding *complexities in deaf students' communication* abilities is cardinal. Schultz et al. (2013) caution educators of deaf students on the need to understand the complexities of both receptive and expressive language, regardless of the strategy an educator employs, bearing in mind that despite hearing loss not affecting a student's intellectual capacity or ability to learn, it is likely to affect speech, language, social and emotional development, and attention span (Schultz et al., 2013) and subsequently have an impact on a student's reading, writing, comprehension, and overall academic performance. Hence the need by educators to use appropriate means of communication that can have positive effects on both academic performance and behavior of deaf students. In reference to communication, both written and signed information from deaf students has to be understood by educators for effective teaching.

In relation to complexities of deaf communication, Supalla & Byrne (2017) note that educators must realise that deaf students encountering English text do not rely on what is called *spoken-language knowledge* due to their being disabled in terms of thinking in and processing English or any spoken language and as such, the English text winds up being strange and inconsistent with how they sign. Supalla & Byrne (2017) further explained how American Sign Language (ASL) *gloss* enables the deaf to learn to read in their own language and simultaneously experience a transition to written English. Based on reading and writing disparities between the deaf and hearing students, educators of the deaf should therefore be mindful of the challenges deaf students are likely to encounter in processing scientific literature and terminologies.

Developing and standardising word-signs

Learners with hearing impairments need word-signs that represent scientific terminologies in order understand scientific concepts. There is need for educators of students with hearing impairments to ensure that word-signs are developed and standardised to help their students to learner science. Kumatongo & Musukwa(2020) noted that performance of student

teachers with hearing impairments in science was largely affected due misinterpretation of scientific terms by sign language interpreters who lacked appropriate word-signs for scientific terms, coupled with their insufficient conceptual knowledge in science as a subject as well as lecturers lack of knowledge in sign language, resulting in learning barriers. Standardising sign-words can also help bridge the gap of limited vocabulary commonly associated with hearing impaired learners (Muzata & Mahlo, 2019).

Use of resource room

Educators must note that learners in inclusive classes are taught collectively and individually. Learners with hearing impairments may not learner at the same pace with their hearing peers in an inclusive learning environment. To ensure effective accommodation of learners, a resource room which is a separate remedial classroom in an inclusive school setting where teachers for learners with hearing impairments and/or other disabilities work individually or with small groups of students for certain subjects to provide specialised instructions in sciences is required(Kumatongo & Muzata, 2021a). Learners with hearing impairments can first be allowed to attend lessons with their peers inclusively, but later receive remediation and individualised services in science (Gettemeier, 2018; Deshpande, 2013), thus enabling educators to attend to individual needs of learners. The use of resource room is one way of promoting adaptability in an inclusive learning environment.

Using professionally trained sign language interpreters

Teaching learners with hearing impairments in the same environments with their peers is just observing a principle of acceptability in inclusive learning. There is need to consider means of making scientific information and concepts accessible to the learners, hence the need to make the learning environment accommodative through the use of professionally trained sign language interpreters. Sign language interpreters in learning institutions need to have specific knowledge of academic content as well as knowledge of child development (Standley, 2005; Kumatongo & Muzata, 2021a). In this context, sign language interpreters should be conversant with scientific knowledge and terminologies to avoid distortion of scientific information during translation (Kumatongo & Musukwa, 2020) and bridge the gap of communication barrier. Sign language interpreters should be capable of perceiving the difficulties of deaf students and of discovering

ways and methods for mitigating them. Hence, the need for interpreters to have a depth of theoretical knowledge of different fields of study, familiarity with the language used in each situation and educational experience (Martins, 2006; Kigotho, 2016). Educators for the deaf students should not only depend on sign language interpreters but should equally possess excellent communication skills to engage in scientific discourse (Graham, 2012).

Adaptation of assessment items

Adaption of science assessment items is inevitable in inclusive education so as to eliminate challenges associated with standardised tests and examinations (Chifinda, 2017; Muzata, 2015), Assessment for learners with hearing impairments just like other exceptional learners should be embracive, basing on the fact that learners have different abilities (Muzata, 2015; Kumatongo & Muzata, 2021a). Tests or examinations that are not developed in consideration of learners' abilities are likely to lead to a high failure rate, increased number of learners dropping out of school, reduced self-esteem (Muzata, 2015), and may affect learners performance.

CONCLUSION

The concept of inclusive education stresses the need for all learners to learn together and ensuring that individual needs are attended to, hence the need for educators to identify the challenges that learners experience in inclusive learning environments and provide appropriate accommodative measures. Accommodative measures reviewed in this article can help learners with hearing impairments in inclusive learning environments and subsequently promote their active participation during learning processes. Effective teaching in an inclusive environment thus require the existence of a system well in-place, were appropriate learning resources are available and accommodative environment in which learners can easily accessed quality education and ultimately lead to conceptual understanding of integrated science.

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