
Assistive Technology Devices: A Panacea for Incorporating Students with Hearing Impairment in Inclusive Settings

¹Ishaq Ibrahim Usman PhD, ²Sagir Garba, & ³Ahmad Modibbo Musa

^{1&3}Department of Special Education, Federal University Dutsin-Ma

²Umar Musa Yar'adua University, Katsina

Email: iishaq@fudutsinma.edu.ng

ABSTRACT

The paper provides an overview of hearing impairment and examines how the condition affects communication, participation, and learning in inclusive classrooms. It also reviews the literature on assistive devices suitable for students with hearing impairment, including types of assistive devices and their usage, inclusive education, and appropriate seating arrangements. Finally, the paper concludes that the effective incorporation of assistive technology devices in inclusive settings is essential for ensuring students with hearing impairment receive equitable access to education. It was recommended that students be adequately trained to use and maintain assistive devices, and that schools secure access to audio logical support to guide their appropriate use.

Key Words: Students with Hearing Impairment, Assistive Devices, Inclusive

INTRODUCTION

The World Health Organization (WHO, 2022) estimated that more than 430 million people of all ages worldwide currently have disabling hearing loss. WHO further stated that young people are particularly vulnerable due to their use of personal listening devices (PLDs) such as smartphones, headphones, and earbuds, as well as exposure to loud music venues, amid poor regulatory enforcement. Given that school-age children and adolescents make up a substantial share of this population, the scale of the problem has direct implications for how classrooms are equipped to support learners with hearing impairment. Gregory (2022) reported research conducted by an international team estimating that 24% of individuals aged 12–34 years listen to music on personal listening devices at unsafe levels. This trend is concerning for schools, as noise-induced hearing loss acquired

during adolescence can compound existing difficulties with classroom listening and participation. WHO (2023) stated that there are over 135 million people with hearing impairment in Africa, and the figure may likely rise to over 338 million by 2050. In Nigeria, it has been estimated that over 8.5 million Nigerians suffer from hearing impairment (Ademokoya, 2023). These figures indicate that a large and growing number of Nigerian and African learners will require accommodation in ordinary classrooms, underscoring the urgency of equipping inclusive schools with assistive technology rather than relying on specialised settings alone. Hearing plays a critical role in communication, speech, language development, and classroom learning. In the classroom specifically, this means that a student's access to spoken instruction, peer discussion, and incidental learning depends heavily on how well their hearing needs are

accommodated. Even a minor degree of hearing loss can have negative effects on speech, language comprehension, communication, classroom learning, and social development. (Centers for Disease Control and Prevention [CDC], 2024). Approximately 60% of common cases of hearing loss could be detected and managed at the primary healthcare level; however, in most settings, access to these services remains limited due to a lack of awareness and inadequate provision of facilities by the government.

Concept of Hearing Impairment

Hearing impairment, also referred to as hearing loss, is categorised under special education and encompasses both deafness and hard of hearing. Aiyaleso (2009), defines it as “a lack or reduction in the ability to hear clearly due to a problem somewhere in the hearing mechanism.” This condition is a serious disability that can delay the development of speech, language, and cognitive skills to such an extent that learning and educational progress become significantly impaired. It is through hearing that a child acquires a linguistic system to transmit and receive information, express thoughts and feelings, and learn (Yakubu, 2017, as cited in Kyauta, 2011). Garuba (2001) opines that “hearing impairment is a condition of the defective organ of hearing; conversely, the hearing-impaired individual is one in whom the sense is so defective that it interferes with the individual’s ability to hear.”

It is often difficult to generalise about children with hearing impairment because, as noted above, there are different classification models. However, as a group, certain features are common:

1. Their ability to hear is limited.
2. Some have co-existing impairments (multiple impairments).

3. Their needs depend on the degree of their hearing loss.

Smith (2007) identifies the following as possible signs or characteristics of hearing impairment: the child watches the teacher’s lips carefully; has a limited vocabulary; articulates speech sounds poorly; shows delayed language development; and does not respond to his or her name when called from behind. The child is inattentive during class discussions, relies excessively on classmates for homework or assignments, complains of earaches, has a runny discharge from the ears, experiences frequent colds or sinus or ear infections, and turns the radio or television volume up very loud.

Assistive Listening Devices

Yakubu (2014), citing Jampala (2007), noted that the educational programme for children with hearing impairment is not uniform across all cases. Children with severe hearing loss or deafness require specialised techniques and materials, while those who are hard of hearing are not very different from their hearing peers except in the areas of speech and reading, though they may be significantly affected in these domains.

Three general types of ALDs are available: hearing aids, cochlear implants, and FM transmission systems. According to the American Speech-Language-Hearing Association (ASHA), the following are examples of assistive technological devices:

Audio Induction Loop (Hearing Loop):

This device transmits sound via a microphone, an amplifier, and wiring that encircles the seating area. It can also be used at counters and other smaller spaces to facilitate one-on-one communication.

FM System: This device uses radio waves to transmit sound from a microphone worn by the speaker to a receiver worn by the

listener. It can be used in a variety of settings, including classrooms, lecture halls, and places of worship.

Infrared System: This device uses infrared light to transmit sound from a microphone to a receiver worn by the listener. It is commonly used in theatres and other large venues.

Personal Amplified System: This device amplifies sound for the listener using a microphone and a small amplifier. It can be used in a variety of settings, including classrooms and small group conversations.

Bluetooth System: This device uses Bluetooth technology to connect to a smartphone, tablet, or other device and stream audio directly to the listener's hearing aids or cochlear implants.

Alerting Devices: These devices emit a loud sound or a flashing light to alert someone with hearing loss to an alarm, doorbell, or ringing telephone.

It is important to note that the most appropriate device for a student with hearing impairment depends on their specific type and degree of hearing loss, as well as the communication environment. It is therefore recommended that a hearing loss assistive technology demonstration be arranged so that students, caregivers, and educators can observe how various ALDs function.

Hearing aids: These devices amplify sound and can be used to assist children with mild to moderate hearing loss.

Cochlear implants: These are electronic devices that are surgically implanted in the ear and can assist children with severe to profound hearing loss.

Assistive listening systems: These systems use a microphone to capture the teacher's voice and transmit it directly to the child's hearing aid or cochlear implant, thereby

reducing background noise and improving voice clarity.

Induction loops: These are wire loops installed around a room that transmit sound directly to a child's hearing aid or cochlear implant, reducing background noise and improving the clarity of the teacher's voice.

Remote microphones: These are small microphones worn by the teacher or placed on a desk that transmit sound directly to a child's hearing aid or cochlear implant, reducing background noise and improving speech clarity.

Augmentative and alternative communication (AAC) devices: These devices assist children who have difficulty communicating verbally. They include keyboards, touchscreens, and display panels.

It is important to note that each child's needs are unique, and the most appropriate assistive listening device for one child may not be suitable for another. Collaboration between the child's audiologist and teacher is essential in determining the most appropriate device. Additionally, accommodations such as preferential seating and regular check-ins to ensure the child understands instructions can further contribute to an inclusive learning environment.

Concept of Inclusive Education

Inclusive education is a comprehensive approach that aims to provide equal access to education for all students. It involves creating an inclusive environment, empowering children with disabilities, and promoting positive outcomes for all students. Successful implementation requires a transformation in culture and practice, as well as support from all stakeholders involved (UNESCO, 2009).

Inclusive education means opening access to a wide range of educational and social opportunities for all children, not only those with disabilities. It involves placing all students, including those with disabilities, in age-appropriate general education classes in their neighbourhood schools. In other words, inclusive education is when all students, regardless of any challenges they may have, are placed in age-appropriate general education classes that are in their neighbourhood schools to receive high-quality instruction, interventions, and support that enable them to succeed in the core curriculum (Alquraini & Gut, 2012; Bui, Quirk, Almazan, & Valenti, 2010).

The school and classroom operate on the premise that students with disabilities are as fundamentally capable as students without disabilities and can be full participants in their classrooms and the wider school community. Much of the movement for inclusive education is rooted in legislation requiring that students receive their education in the least restrictive environment (LRE), meaning they are educated alongside their peers without disabilities to the maximum degree appropriate, with general education as the placement of first choice for all students (Alquraini & Gut, 2012).

Successful inclusive education is primarily achieved through accepting, understanding, and attending to student differences and diversity, which may be physical, cognitive, academic, social, or emotional. This is not to say that students never require time outside of regular education classes; occasionally they do for specific purposes, such as speech or occupational therapy. However, the goal is for such arrangements to remain the exception, not the rule.

The driving principle is to make all students feel welcomed, appropriately challenged, and supported in their efforts. It is also

critically important that adults be supported as well, including regular education teachers, special education staff, other faculty and personnel, and parents.

Incorporating Students with Hearing Impairment in an Inclusive Setting Using Assistive Devices

Assistive technology can be a key factor enabling individuals with disabilities to participate in daily life and be included in society (Hurst, Miller, & Üstün, 2003). However, this technology has a dual nature: it is both a tool for achieving independence and a visible marker of disability (Scherer, 2002). Assistive technology that is perceived as a tool for achieving desired activity is more likely to be integrated into the user's life. Conversely, technology perceived as a visible marker of disability can reinforce associated stigma. Because individuals who hold the latter view may avoid or resist using such technology, they may withdraw from meaningful activities and experience social and physical isolation (Polgar, 2010).

Hearing technologies for deaf and hard-of-hearing (DHH) individuals include personal amplifiers (e.g., hearing aids and cochlear implants), which are typically worn on the head or body, as well as assistive listening devices not worn on the body, such as classroom sound field amplification systems (Dillon, 2001). Specialised hearing technologies may reduce the impact of barriers that DHH students encounter in school settings, including classroom noise, rapid rates of discussion, rapid topic changes, and large numbers of simultaneous conversations, all of which can prevent DHH students from participating in teacher–student and student–student interactions (Luckner & Muir, 2001; Stinson & Antia, 1999). Although DHH students and their teachers report that the use of hearing technology is essential for ensuring effective inclusion (Eriks-Brophy et al., 2006;

Luckner & Muir, 2001), equipment is sometimes used irregularly due to the stigma associated with assistive technologies.

The majority of DHH children in the western world attend inclusive schools; however, there has been limited research examining how these children perceive their hearing technology or how the technology is utilised. Children are infrequently asked about their experiences with hearing technology, and scholarly attention has been primarily concentrated on the impact of personal aids on speech perception (Anderson & Goldstein, 2004; Beadle et al., 2005; Iglehart, 2004; Loy, Warner-Czyz, Tong, Tobey, & Roland, 2010; Odelius, 2010; Yoshinaga-Itano, 1999). Qualitative studies on this subject have focused more on personal amplifiers and less frequently on assistive listening devices (Kent & Smith, 2006; Preisler & Tvingstedt, 2005; Wheeler, Archbold, Gregory, & Skipp, 2007). In research on the use and non-use of hearing aids among children and the sense of stigma associated with hearing aids, participant groups have included teachers, parents, and hearing peers, but not the DHH children themselves (Blood, Blood, & Danhauer, 1978; Brimacombe, Danhauer, & Mulac, 1983; Clarke & Horvath, 1979; Cox, Cooper, & McDade, 1989; Dengerink & Porter, 1984; Haley, Stephen & Donna, 1986; Ryan, Johnson, Strange, & Yonovitz, 2006; Silverman & Klees, 1989; Strange, Johnson, Ryan, & Yonovitz, 2008; Vesterager & Parving, 1995). In contrast, numerous studies have examined adults with hearing disabilities and their attitudes, feelings of stigma, and quality of life in relation to hearing aid use (Arnold & MacKenzie, 1998; Bertoli et al., 2009; Bisgaard, 2008; Cameron et al., 2008; Cohen, Labadie, Dietrich, & Haynes, 2004; Laplante-Levêque, Hickson, & Worrall, 2010; Öberg, 2008; Wong, Hickson, & McPherson, 2009). Children fitted with

hearing aids or cochlear implants in early childhood may integrate such devices into their daily lives (Preisler & Tvingstedt, 2005), which may explain why there has been less focus on children's use of these devices compared with adults who have acquired hearing loss.

CONCLUSION

Inclusive education is widely regarded as a means of empowering children with disabilities by enabling them to realise their rights, participate in their communities, and overcome barriers associated with poverty and marginalisation. It aims to strengthen their voices and provide them with the means to participate fully in society. The effective incorporation of assistive technology devices within inclusive educational settings is essential for ensuring that students with hearing impairment receive equitable access to education and are afforded the opportunity to reach their full potential.

RECOMMENDATIONS

The following recommendations are important when applying assistive technological devices in an inclusive setting:

4. The child should be thoroughly trained in the proper use of assistive devices.
5. The child should be trained in how to maintain the devices.
6. The school should have access to an audiologist who will oversee the appropriate care and management of the devices.
7. Regular teacher training should be provided so that classroom teachers can competently use, troubleshoot, and integrate assistive devices into everyday instruction.
8. Government should provide dedicated funding to make assistive devices

affordable and accessible to schools serving students with hearing impairment.

9. Schools should invest in the infrastructural development needed to support assistive technology, such as reliable electricity, acoustically appropriate classrooms, and sound-field or induction-loop installations.
10. Clear maintenance strategies, including scheduled servicing and readily available replacement parts, should be established to keep devices functioning reliably.
11. Policy implementation at the institutional and national level should mandate the provision of assistive technology as part of inclusive education standards.
12. Continuous monitoring and evaluation of assistive technology use should be conducted to ensure devices remain effective and to identify students who may need additional support.

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