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ASSISTIVE TECHNOLOGY AND INCLUSION OF CHILDREN WITH DISABILITIES IN NIGERIA

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ABSTRACT: *Assistive technology (AT) is increasingly recognized as a powerful tool in bridging the gap, offering the potential to enhance the learning experience and integration of children with disabilities. This paper examined the role of assistive technology in enhancing the inclusivity of children with disabilities in Nigeria. The study adopted the survey research design. To ensure the efficient and comprehensive collection of data for the study on assistive technology and the inclusion of children with disabilities in Nigeria, the use of digital online interviews and questionnaires was adopted. Thematic analysis and one-sample t-statistics was used to analyze the set of data that was collected from the study sample. The results demonstrate how important assistive technology is in enabling inclusive educational opportunities for children with disabilities by giving them the resources they require to participate in schooling and actively engage in the process of learning. Additionally, it was discovered that learning challenges in math, writing, and reading are addressed by assistive technology. It was finally discovered that children with impairments who use assistive technology (AT) find it much easier to learn independently. It is therefore recommended that to ensure the widespread availability and accessibility of assistive technology (AT) in Nigerian schools, increased funding and resource allocation are essential. The government, in collaboration with international organizations and NGOs, should establish dedicated funds for purchasing AT devices and maintaining existing ones. This financial support should also cover the costs of training educators and technical staff.*

KEYWORDS: Assistive Technology, Disability, Children, Inclusion.

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INTRODUCTION

Globally, there are over 240 million children with disabilities. The majority of these children are shunned by their families, ridiculed by society, and abandoned by their governments (UNICEF, 2021). Based on household surveys of child functional status, it is predicted that 28.9 million (4.3%) children worldwide have moderate-to-severe disabilities, 207.4 million (12.5%) children worldwide between 5–17 years have moderate-to-severe disabilities, and same applies to 236.4 million (10.1%) globally (Bolajoko et al., 2022). Approximately, 266 million children aged 0–19 years are expected to have moderate-to-severe disabilities. In contrast, GBD 2019 estimated that 49.8 million (7.5%) children aged under 5 years, 241.5 million (12.6%) children aged 5–19 years, and 291.3 million (11.3%) children younger than 20 years have mild-to-severe disabilities. In both databases, sub-Saharan Africa and South Asia accounted for more than half of children with disabilities (UNICEF, 2021). There are a lot of disabled children living in sub-Saharan Africa, and many of them do not have access to basic medical treatment. According to the UNICEF study from 2021, the majority of African countries only maintain partial records of disability statistics. They are also restricted to prevalence data based on impairments, and they primarily concentrate on the most obvious types of functional restrictions, such as physical disabilities (UNICEF, 2021). The inclusion of children with disabilities in mainstream education is a fundamental human right and a critical aspect of social justice (Danniels & Pyle 2024). In many developing countries, such as Nigeria, achieving this inclusivity poses significant challenges (Difoini *et al.*, 2024). Assistive technology (AT) is increasingly recognized as a powerful tool in bridging the gap, offering the potential to enhance the learning experience and integration of children with disabilities (Karki, *et al.* 2023). This research explores the role and impact of assistive technology in promoting the inclusion of children with disabilities in Nigeria's educational system.

Inclusive education aims to ensure that all children, regardless of their physical, intellectual, social, emotional, linguistic, or other conditions, can participate in and benefit from mainstream education (Donath, *et al.* 2023). This approach aligns with international frameworks such as the United Nations Convention on the Rights of Persons with Disabilities (CRPD) and the Sustainable Development Goals (SDGs), which advocate for inclusive, equitable, and quality education for all. Assistive technology is a critical component in achieving these goals, providing children with disabilities the tools they need to access the curriculum and participate fully in school life (Allen, Metternicht & Wiedmann, 2018).

Assistive technology encompasses a broad range of devices, software, and equipment designed to support individuals with disabilities in performing functions that might otherwise be difficult or impossible. This includes simple tools like magnifiers and hearing aids, as well as more advanced systems like computer software for speech recognition and educational apps tailored for specific learning disabilities (Smith *et al.*, 2024). The effective implementation of AT in education can significantly enhance the learning experience, enabling children with disabilities to achieve academic success and develop essential life skills Kabariah & Adiyono, 2023).

Nigeria, the most populous country in Africa, faces considerable challenges in implementing inclusive education (Heaton, 2024). The country has a diverse population with significant socio-economic disparities and a complex educational landscape (Agboola & Fasasi, 2024). Despite ratifying the CRPD and adopting policies aimed at promoting inclusive education, the practical realization of these policies is hampered by numerous barriers. These include

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inadequate funding, lack of trained personnel, cultural attitudes towards disability, and insufficient infrastructure.

According to a report by the United Nations Children's Fund (UNICEF), millions of Nigerian children with disabilities remain out of school (Canton, 2021). Those who do attend often face a lack of appropriate resources and support, leading to high dropout rates and poor educational outcomes. This situation underscores the urgent need for effective interventions, such as the integration of assistive technology, to facilitate the inclusion of children with disabilities in the education system (Canton, 2021). The implementation of assistive technology in Nigerian schools presents both challenges and opportunities. Key challenges include limited awareness and understanding of AT among educators and policymakers, high costs of technology, and the lack of infrastructure to support its use. Additionally, there is a need for ongoing training and support for teachers to effectively integrate AT into their teaching practices (Chukwuemeka & Samaila, 2020).

The availability of AT in Nigerian schools is generally limited. A significant number of schools, particularly in rural areas, lack essential AT devices such as hearing aids, screen readers, and mobility aids. This shortage is largely due to financial constraints and insufficient government funding (Johnson & Degener, 2022). Furthermore, there is a pronounced disparity between urban and rural areas regarding the availability of AT. Urban schools are more likely to have access to AT due to better funding, infrastructure, and proximity to suppliers. In contrast, rural schools often struggle with a lack of resources and support (Olaleye & Oladipo, 2022).

Despite these challenges, there are significant opportunities to leverage assistive technology to enhance inclusive education in Nigeria. The growing availability of mobile technology and internet connectivity offers new avenues for delivering AT solutions. Moreover, international partnerships and funding initiatives can play a crucial role in supporting the development and deployment of assistive technologies in Nigerian schools (Obim & Akpokurerie, 2022).

LITERATURE REVIEW

A study by Vincent *et al.* (2024) explored the use of AT in technical colleges in Ondo State, Nigeria. The findings revealed that while AT is available in these institutions, its utilization is limited. The researchers recommend that technical colleges increase access to AT in classrooms and laboratories, and that the government and school management provide adequate resources to enable the implementation and accessibility of AT for all students with disabilities.

Another study by Abiose (2023) aimed to determine the factors influencing lecturers' intention to use assistive technology in colleges of education in northwestern Nigeria. The study found that perceived usefulness, perceived ease of use, and technological self-efficacy significantly influenced lecturers' intention to use AT. The study highlights the importance of addressing these factors to promote the adoption of AT in teacher education programs

A qualitative study by Abani (2023) investigated the perspectives of special education teachers on the role of AT in enhancing the participation of children with disabilities in basic education in Nigeria. The study found that AT facilitates children's inclusion and engagement with

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classroom learning, and helps to solve various learning problems. However, the study also identified challenges such as lack of training, limited funding, and cultural barriers.

In addition, a survey by Yusuf *et al.* (2012) examined the availability of AT in Nigerian educational institutions. The study found that the majority of institutions do not have the required AT for students with disabilities, and that most of the existing equipment is outdated. The study emphasizes the need for increased investment and accessibility of AT in Nigerian schools.

Assistive technology is a broad phrase that refers to tools, applications, and systems that help people who have disabilities enhance or strengthen their functional capacity (Assistive Technology Industry Association, 2020). The word AT can be referred to as custom-built software and hardware. It can exist in various forms such as low-tech or high-tech, and this ranges from room arrangement to pencil grips, that make learning or educational processes more available to certain people. It was defined as "any item, piece of equipment, or product system, whether purchased commercially off the shelf, adapted, or customized, that is used to increase, maintain, or improve functional skills of people with impairments" (Islim *et al.*, 2012). From a similar vantage point, Obim *et al.* (2020) characterized AT as any tool or product that helps or supports a person with a particular disability to perform like others with little to no assistance from people. In the same vein, Dominic *et al.* (2020) referred to AT as software or tools that have been specially created for a specific purpose or that have been modified and utilized to provide technical support for educators and learners with disabilities.

Furthermore, Disability.gov (2012) explained AT as "any tech innovation, piece of device, tool, or system that assists individuals who have disabilities to actively engage in school and other related activities. AT includes wheelchairs, walkers, computer applications, hardware, and computer attachments. AT are tools that can be in the form of hardware or software that improve movement, listening, movement, visual, and communication capabilities. Individuals with severe impairments have the opportunity to live independently and contribute to society (WHO, 2012).

Assistive Technology

Assistive technology refers to devices, tools, software, or equipment that help people with disabilities to perform tasks that might otherwise be difficult or impossible for them. Its primary goal is to enable individuals to live more independently, enhance their quality of life, and participate more fully in society (Smith *et al.*, 2024). Assistive technology (AT) encompasses a broad range of tools, devices, and technologies designed to enhance the functional capabilities of individuals with disabilities. The meaning of assistive technology goes beyond just devices; it includes the principles and dimensions that define its scope and application (Smith *et al.*, 2024).

Assistive technology aims to compensate for impairments and enhance functional abilities. It can include devices that assist with mobility (like wheelchairs or walkers), communication (such as speech-to-text software or communication boards), sensory aids (like hearing aids or magnifiers), and activities of daily living (such as adaptive utensils or home automation) (McNicholl, Desmond, & Gallagher, 2023). Central to the concept of assistive technology is its role in improving accessibility. This involves making environments, information, and tasks accessible to individuals with disabilities who may otherwise face barriers. Accessibility

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features can range from physical modifications (ramps, accessible doors) to digital accessibility (screen readers, alternative text for images) (Mensah-Gourmel *et al.*, 2023). The field of assistive technology is dynamic, with ongoing innovation and development driven by advancements in technology and user needs. Emerging technologies such as artificial intelligence, robotics, and sensor technology continue to expand the possibilities of AT (Mensah-Gourmel *et al.*, 2023).

Assistive technology makes everyday tasks more accessible for individuals with disabilities. This includes activities like communication (augmentative and alternative communication devices), mobility (wheelchairs, walkers), and daily living tasks (adaptive utensils, home automation) (Manirajee, Rashid, & Shariff, 2024).

Importance of Assistive Technologies

Assistive technology (AT) plays a crucial role in aiding children with disabilities by enhancing their independence, access to education, social interaction, and overall quality of life. Here are some key points highlighting the importance of AT in this paper:

i. Accessibility and Inclusion in Education

AT helps to level the playing field for children with disabilities in educational settings. It enables them to access educational materials, participate in classroom activities, and complete assignments more effectively. For example, screen readers and text-to-speech software assist children with visual impairments or learning disabilities in accessing written content (Smith *et al.*, 2024).

ii. **Support for Communication**

Many children with disabilities face challenges in verbal communication. AT devices such as communication boards, speech-generating devices, and AAC (Augmentative and Alternative Communication) systems help them to express themselves, interact with peers and teachers, and engage in social activities more confidently (Smith *et al.* 2024).

iii. **Improvement in Mobility and Physical Independence**

Mobility aids like wheelchairs, walkers, and prosthetic devices enhance physical mobility and independence for children with physical disabilities. These technologies enable them to navigate their environments, participate in physical activities, and perform daily tasks more autonomously (Sánchez, Reyes-Rojas, & Alé-Silva, 2024).

iv. **Enhanced Learning and Cognitive Development**

Various AT tools support children with cognitive disabilities or developmental delays in learning and skill development. Educational software, adaptive learning platforms, and specialized apps tailored to individual learning needs help reinforce concepts, improve memory, and enhance cognitive abilities (Sánchez, Reyes-Rojas, & Alé-Silva, 2024).

v. Promotion of Social Interaction and Emotional Well-being

AT fosters social inclusion by facilitating communication and interaction with peers and family members. Social skills training programs and apps help children with autism spectrum

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disorders or social communication challenges to develop social skills, build relationships, and reduce feelings of isolation (McNicholl, Desmond, & Gallagher, 2023).

vi. **Customization and Personalization**

One of the significant advantages of AT is its ability to be customized to meet individual needs. AT devices and software can be tailored to accommodate specific disabilities, preferences, and learning styles, ensuring that each child receives appropriate support and assistance (McNicholl, Desmond, & Gallagher, 2023).

vii. **Empowerment and Self-Esteem**

By enabling children to actively participate in various activities, AT promotes a sense of empowerment and boosts self-esteem. When children can independently accomplish tasks that were previously challenging, they experience increased confidence and a more positive outlook on their abilities (McNicholl, Desmond, & Gallagher, 2023).

viii. **Family and Caregiver Support**

AT not only benefits children but also supports their families and caregivers. It provides tools and resources to parents, teachers, and therapists to better understand and support the needs of children with disabilities, thereby improving overall caregiving and educational outcomes (Karki *et al.,* 2023).

THEORETICAL LITERATURE

The inclusion of children with disabilities in education, supported by assistive technology (AT), is underpinned by several key theories and concepts. Understanding these foundational ideas is essential for comprehending how AT can facilitate inclusive education in Nigeria and similar contexts. This section discusses the key theories.

Social Model of Disability

The social model of disability which was propounded by a disabled academic, Mike Oliver, in 1983 distinguishes between "impairment" (a physical or mental condition) and "disability" (the social disadvantages and exclusions resulting from impairments). This model posits that disability is not an inherent trait of the individual but rather a result of societal barriers. In this context, assistive technology is seen as a means to remove or mitigate these barriers, enabling full participation of individuals with disabilities in society, including in educational settings (Connors & Stalker, 2020). The Social Model of Disability is particularly relevant to this study on assistive technology and the inclusion of children with disabilities in Nigeria for several reasons. It provides a foundational perspective that shifts the focus from the individual impairments of children to the societal and environmental barriers that hinder their full participation in education. Understanding and applying the principles of the Social Model of Disability can significantly enhance the development and implementation of inclusive education strategies, particularly through the use of assistive technology.

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Universal Design for Learning (UDL)

Universal Design for Learning is an educational framework that aims to improve and optimize teaching and learning for all people based on scientific insights into how humans learn. UDL emphasizes the need to create flexible learning environments that can accommodate individual learning differences (Al-Azawei, Serenelli, & Lundqvist, 2016). Universal Design for Learning (UDL) is a crucial framework for understanding and promoting the inclusion of children with disabilities in Nigeria through the use of assistive technology. UDL provides a structured approach to creating educational environments that accommodate the diverse needs of all learners, thereby supporting the goals of inclusive education. Universal Design for Learning (UDL) is highly relevant to this study as it provides a comprehensive framework for creating inclusive educational environments that accommodate the diverse needs of all students. By emphasizing flexibility in teaching methods, enhancing student engagement, removing barriers to learning, supporting professional development for educators, and informing policy and advocacy efforts, UDL aligns closely with the goals of promoting inclusive education through the use of assistive technology. Implementing UDL principles can help ensure that children with disabilities in Nigeria have equal access to high-quality education and the opportunity to reach their full potential.

Ecological Systems Theory

Bronfenbrenner's Ecological Systems Theory provides a framework for understanding how different environmental systems influence child development. This theory can be applied to inclusive education by recognizing that multiple layers of environment, from the immediate family and school settings to broader societal and policy contexts, impact the education of children with disabilities (Burns, Warmbold-Brann, & Zaslofsky, 2015). Ecological Systems Theory is highly relevant to the study of assistive technology and the inclusion of children with disabilities in Nigeria. By considering the multiple environmental layers and their interactions, this theory provides a holistic perspective on the factors that influence educational outcomes for children with disabilities. It underscores the importance of supportive family environments, collaborative home-school relationships, accessible community resources, positive cultural attitudes, and robust policies. Furthermore, it highlights the need to consider temporal changes and technological advancements in planning and implementing inclusive education strategies. Adopting an ecological approach can lead to more effective and sustainable solutions for integrating assistive technology in Nigerian schools, ultimately enhancing the educational experiences and outcomes for children with disabilities.

METHODOLOGY

Data Collection

To ensure the efficient and comprehensive collection of data for the study on assistive technology and the inclusion of children with disabilities in Nigeria, the use of digital online interviews and questionnaires was adopted. This method leverages technology to reach a diverse and widespread population while maintaining flexibility and convenience for participants (Tomas & Bidet, 2024). Data was collected from special education teachers who had been employed for seven (7) years and held a certification in the use of assistive technology. As a result, for this study, fourteen (14) teachers were sampled.

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Analysis and Techniques

Thematic analysis and one-sample t-statistics was used to analyze the set of data that was collected from the study sample. Thematic analysis is a method that is being used to analyze qualitative data that involves looking through data collection to find, examine, and report recurring themes. Also, it is a technique for categorizing data, and interpreting them using codes and themes (Braun & Clarke, 2023). The most suitable method for any research that aims to find perspectives is thought to be thematic analysis. It adds a methodical component to data analysis. It enables the researcher to link the frequency distribution of a theme to a content study of the entire text. This will add precision and complexity and strengthen the overall meaning of the research (Braun & Clarke, 2023). On the other hand, the one-sample t-statistic is a method used in inferential statistics to determine whether there is a significant difference between the mean of a single sample and a known population mean. It is particularly useful when the population standard deviation is unknown and the sample size is relatively small (typically $n < 30$) (Mishra *et al.*, 2019).

RESULTS AND FINDINGS

The results demonstrate how important assistive technology is in enabling inclusive educational opportunities for children with disabilities by giving them the resources they require to participate in schooling and actively engage in the process of learning. Additionally, it was discovered that learning challenges in math, writing, and reading are addressed by assistive technology. It was finally discovered that children with impairments who use assistive technology (AT) find it much easier to learn independently. Assistive technology is not merely a tool but a transformative enabler for Nigerian children with disabilities, addressing systemic barriers, enhancing their capabilities, and promoting inclusive development. Investing in AT infrastructure, training stakeholders, and fostering collaboration between government, NGOs, and private sectors are crucial steps towards realizing the full potential of AT in improving the lives of children with disabilities in Nigeria. By prioritizing AT initiatives, Nigeria can advance towards achieving equitable opportunities and a more inclusive society for all children, regardless of their abilities.

CONCLUSION/SUMMARY

Children with disabilities will benefit from assistive technology in a variety of ways, including enhanced communication, increased independence, and easier access to educational resources. Customizing educational materials to meet the specific requirements of kids with disabilities is also beneficial. Furthermore, because assistive technology allows kids with disabilities to engage in educational activities with their classmates, it will promote inclusion in the classroom. Their sense of self-worth and belonging may therefore increase as a result, encouraging healthy social and emotional growth. By bridging the gap between the child's skills and the curriculum, assistive technology can help children with disabilities become more autonomous learners and give them the support they need to study. All things considered, assistive technology is an essential tool that ensures children with impairments have equal opportunities and gives them the drive they need to achieve. Before implementing AT in the

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classroom, it is crucial to take the child's unique demands and individual peculiarities into account.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are suggested:

i. To ensure the widespread availability and accessibility of assistive technology (AT) in Nigerian schools, increased funding and resource allocation are essential. The government, in collaboration with international organizations and NGOs, should establish dedicated funds for purchasing AT devices and maintaining existing ones. This financial support should also cover the costs of training educators and technical staff.

ii. Government policies should explicitly support the integration of AT in educational settings. These policies should include mandates for schools to incorporate AT in their teaching methods, provide funding for AT resources, and ensure regular monitoring and evaluation. Policies should also address the need for accessible infrastructure, such as ramps and lifts, to accommodate students using mobility aids.

iii. Educators need comprehensive training on the use of AT to support students with disabilities effectively. Teacher training programs should include modules on AT, covering both theoretical knowledge and practical applications. Continuous professional development opportunities should be provided to keep educators updated on the latest AT advancements and best practices in inclusive education.

iv. Raising awareness about the benefits of AT and the importance of inclusive education is crucial. Campaigns should target educators, parents, policymakers, and the general public to foster a positive attitude towards AT and inclusion. Advocacy efforts should highlight success stories and the positive impact of AT on the lives of children with disabilities.

v. Collaboration between various stakeholders, including government agencies, NGOs, private sector companies, and educational institutions, is vital for the successful implementation of AT. These partnerships can facilitate resource sharing, provide technical expertise, and support the development of innovative AT solutions tailored to the Nigerian context.

vi. Ongoing research is needed to identify the most effective AT solutions and understand the unique needs of children with disabilities in Nigeria. Universities and research institutions should be encouraged to conduct studies on AT and inclusive education. Research findings should inform policy decisions, training programs, and the development of new AT devices.

While exploring the role of assistive technology (AT) in enhancing the inclusion of children with disabilities in Nigerian education settings is crucial, the study faces several limitations that may affect the interpretation and generalizability of its findings.

While exploring the role of assistive technology (AT) in enhancing the inclusion of children with disabilities in Nigerian education settings is crucial, the study faces several limitations

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that may affect the interpretation and generalizability of its findings. This is because Urban areas and well-funded schools may have better access to a variety of AT devices compared to rural or under-resourced schools. This disparity can skew the findings, as students in more privileged settings might experience different educational outcomes than those in marginalized areas.

Another limitation is the varying levels of awareness and training among educators and stakeholders regarding the use and benefits of assistive technology. This is because lack of adequate training for teachers and support staff on how to effectively integrate AT into their teaching practices can hinder its implementation. This could influence the way AT is utilized and impact the results of the study, as successful integration often relies on knowledgeable and skilled educators.

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