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Promoting Inclusive Classroom Management through Assistive Technologies for Students with Hearing Impairment in Ibadan Metropolis

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Abstract
This study explored the promotion of inclusive classroom management through assistive technologies for learners with hearing impairment (HI) in Ibadan Metropolis, Nigeria. Sample for the study comprised 385 secondary school teachers selected using stratified random sampling. Through a descriptive research design, data was collected by administering Assistive Technologies and Inclusive Classroom Management Questionnaire (ATICMQ) designed by the researcher. Simple linear regression and Pearson product-moment correlation were used for analyzing the study hypotheses. The use of AT and inclusive classroom management, according to the results were significantly positively correlated ($r = 0.565$, $p < 0.001$). Significant impact of teachers' AT proficiency on effective classroom management was also found ($t=10.235$, $\beta=0.464$, $p<0.001$). Moreover, availability of AT in schools had a significant influence on students' academic engagement ($t=20.921$, $\beta=0.265$, $p<0.001$). The study then concludes that assistive technology (AT) is important in creating inclusive classroom environments and improving learning outcomes for children with hearing impairments. The need to increase AT provision in schools, regular teacher training on inclusive practice for managing students with HI, and funding-appropriate supportive policies are among the recommendations.

Keywords: Assistive Technologies, Inclusive Classroom Management; Hearing Impairment; Ibadan Metropolis, Promotion.

Introduction

Inclusive education is a crucial global goal, emphasizing the provision of equitable learning opportunities for all students regardless of their physical, sensory, or cognitive strength and limitations (Thomas, 2022). Students with hearing impairments (HI) encounter particular difficulties among the diverse student body, which can seriously impede their ability to participate in classroom activities and obtain an education (Adeduyigbe et al. 2024). These difficulties are made worse in many poor contexts, including Ibadan Metropolis, Nigeria, by a lack of resources, inadequate training for teachers, and conventional classroom management strategies that fail to sufficiently address the needs of students with hearing impairments (Okoye, 2024). As a result, encouraging inclusive classroom management by incorporating assistive technology presents a viable option to improve academic results and learning opportunities for this underserved population.

Devices, software, or equipment intended to enhance functional capacities for people with disabilities are referred to as assistive technology (World Health Organization [WHO], 2018). These technologies, which improve communication and participation in classroom settings, include speech-to-text programs, FM systems, visual alert systems, real-time captioning, and hearing aids for students with hearing impairments (Adeduyigbe et al., 2024). By encouraging varied instruction and meeting a range of learning requirements, the use of these technologies in the classroom is consistent with the principles of universal design for learning (UDL) (Kushalnagar, 2019). Additionally, by reducing the barriers imposed by conventional teaching approaches that mostly rely on oral communication, assistive technology can be used effectively to create an inclusive atmosphere in which students with hearing impairments can actively participate alongside their

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hearing counterparts.

Notwithstanding the obvious advantages, a number of studies draw attention to the difficulties in implementing assistive technology in Nigerian classrooms, including a lack of financing, a lack of teaching experience, and a lack of knowledge about the technologies that are available (Okoye, 2024). These problems are especially noticeable in Ibadan Metropolis because of the city's expanding population and the pressure on its educational system. Thus, it is essential to comprehend how to include assistive technology into classroom management techniques in order to foster inclusion and enhance learning outcomes for students with hearing impairments in this setting.

Vygotsky (1976) Social Constructivist Theory provides a theoretical base for this study. According to this idea, information is created through meaningful communication in a social setting, and it highlights the value of social interaction and cultural resources in the learning process. Traditional classroom communication can be a major obstacle for students with hearing impairments, reducing their involvement and participation. Visual alert systems, speech-to-text software, and hearing aids are examples of assistive technology that serve as mediation tools to close communication gaps between students with hearing impairments and their peers or teachers. These tools help the student reach their Zone of Proximal Development (ZPD), which allows them to do things they couldn't do on their own, according to Vygotsky. Teachers may foster an inclusive atmosphere where students with hearing impairments can actively engage, collaborate, and build knowledge alongside their hearing counterparts by incorporating assistive technologies. The employment of assistive technologies as essential social and cultural mediators in inclusive classroom management is thus justified by Vygotsky's theory. It emphasizes how these resources might improve involvement, communication, and eventually the social and academic growth of students with hearing impairments in Ibadan Metropolis. In order to support inclusive classroom management for students with hearing impairments in Ibadan Metropolis, this study aims to investigate the effective use of assistive technologies. It seeks to offer useful suggestions that can guide resource allocation, teacher preparation, and policy by analyzing existing practices, obstacles, and possibilities in order to promote a more inclusive learning environment.

Literature Review

The importance of assistive technology in promoting inclusive classroom management for students with hearing impairments has been highlighted more and more in recent research. The goal of inclusive education is to provide all pupils, including those with sensory impairments like hearing impairment, fair participation and access to education (UNESCO, 2020). According to studies, assistive technology greatly enhances engagement and communication, which helps teachers run more inclusive and efficient classrooms (Adeduyigbe et al., 2024; Kalist, Frank Joe & Veeramuthu, 2020). Specifically, it has been shown that technologies like visual alert tools, captioning software, frequency modulation (FM) systems, and hearing aids lower barriers to communication and improve students' understanding and engagement in a variety of learning environments (Okoye, 2024; Neves & Farias, 2024).

According to studies, there is an increasing but still modest uptake of these technologies in regular classrooms in Nigeria, particularly in Ibadan Metropolis. Inadequate finance, a lack of specialized training for educators, and deficiencies in infrastructure frequently impede implementation (Philips & Awujoola, 2024). When it comes to meeting the requirements of hearing-impaired students, who could otherwise be excluded or marginalized, these obstacles add to ongoing difficulties in classroom management (Adeduyigbe et al., 2024). Nonetheless, when assistive technologies are properly incorporated, they not only increase student autonomy but also give teachers the ability to use differentiated teaching methods that meet a range of communication demands (Neves & Farias, 2024). This aligns with Universal Design for Learning's tenets, which encourage adaptability and accessibility in teaching methods (Pradhan, 2024).

Moreover, there has been a growing body of research on the connection between inclusive classroom management and assistive technology use for students with hearing impairments, particularly in developing contexts like Ibadan Metropolis. According to Okoye (2024), assistive technology is acknowledged as essential resources that improve the classroom environment by facilitating communication, engagement, and learning for students with hearing impairments. Research has indicated a noteworthy beneficial association between the implementation of these technologies and enhanced inclusive classroom management, resulting in the greater integration and assistance of students with hearing loss in regular classroom environments (Thomas, 2022). This connection emphasizes how crucial technology interventions are for advancing equity and lowering obstacles to education.

The effectiveness of inclusive classroom management is also significantly influenced by teachers' level of competency with assistive technology. According to research, teachers with sufficient training and expertise in using these devices can interact with hearing-impaired students more successfully and modify their teaching strategies accordingly (Philips et al., 2024). For example, Perez-Enriquez et al. (2024) point out that teacher competency affects the creation of an inclusive classroom culture that is sensitive to a range of communication demands in addition to the seamless operation of assistive technology. On the other hand, insufficient proficiency frequently leads to learners with hearing impairments using available resources less effectively and achieving lower educational achievements.

Furthermore, the academic engagement of students with hearing impairments in Ibadan Metropolis is directly impacted

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by the provision of assistive devices in schools. One of the main obstacles to inclusive education has been identified as limited access to these technology, which has been linked to hearing-impaired students' lower academic performance and less classroom participation (Asuncion et al., 2024). On the other hand, schools that have FM systems, real-time captioning tools, and hearing aids give students more visual and auditory support, which improves understanding and interaction (Tumewu et al., 2024). In addition, Neves et al. (2024) stress that student engagement and academic success are significantly improved when availability is combined with instructor support.

Notwithstanding these encouraging results, obstacles such a lack of financing, upkeep problems, and insufficient teacher preparation still prevent assistive technology from being widely adopted and used effectively in many Nigerian schools, including those in Ibadan (Adeduyigbe et al., 2024). Maximizing the advantages of assistive technologies for inclusive classroom management and student involvement requires addressing these issues through resource allocation, capacity building, and policy reforms.

Statement of the Problem

In Ibadan Metropolis, students with hearing impairments continue to encounter obstacles to efficient classroom management and participation, despite heightened awareness of inclusive education. Visual alert tools, captioning systems, and hearing aids are examples of assistive technologies that can help close communication gaps and promote inclusive learning settings. It's unclear, though, how much of these tools are used for classroom management. Effective management of inclusive classrooms may be hampered by the fact that many teachers lack the necessary training or expertise in employing assistive technology. Furthermore, differences in the accessibility of assistive technology among schools may have an additional impact on the academic engagement and learning experience of children with hearing impairments.

This study addresses three germane issues bordering on how inclusive classroom management and assistive technology use are related, how teachers' use of assistive technology affects their ability to effectively manage the classroom, and how the availability of these technologies affects hearing-impaired students' academic engagement. In order to improve inclusive practices and provide equitable educational opportunities for all kids in Ibadan Metropolis, regardless of hearing ability, these gaps must be filled

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Hypothesis

The following hypotheses which guided the study were tested at 0.05 alpha level:

1. There is a no significant positive relationship between the use of assistive technologies and the level of inclusive classroom management for learners with hearing impairment in Ibadan Metropolis.
2. Teachers' proficiency in using assistive technologies significantly influences the effectiveness of classroom management for learners with hearing impairment.
3. The availability of assistive technologies in schools positively affects the academic engagement of learners with hearing impairment in Ibadan Metropolis.

Methodology

A descriptive survey research design was adopted for the study. The target population comprised all teachers working with learners with hearing impairment across secondary schools in Ibadan Metropolis. A stratified random sampling method was used to select 385 teachers for the study base on Cochran's formula for detraining the sample size for unknown population. Data was collected suing Assistive Technologies and Inclusive Classroom Management Questionnaire (ATICMQ) designed by the researcher. The instrument contained four sections. Section A taps into demographic information such as the gender, age, educational qualification and years of experience of the respondents. Sections B, C and D focus on use of assistive technologies, teachers' proficiency, and availability of assistive devices respectively. Each of the sections contain 5 items and uses 4-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (4). The face, content and construct validity of the questionnaire was achieved through vetting and review by two experts in special education, one in educational technology and two in Measurement and Evaluation. Thereafter, a pilot test conducted with 15 teachers outside the study area and it yielded a reliability coefficient of 0.83 using Cronbach's Alpha.

Ethical procedure was followed in carrying out the study. Permission to carry out the study was sought and secure from relevant authorities. Respondents were assured of confidentiality and voluntary participation. Completed questionnaires were collected on the spot or within two days. Copies of the questionnaire was administered to the respondents in their school with the assistance of two trained research assistants within 2 weeks. The completed copies were retrieved from the respondents upon completion. Data collected were analyzed using descriptive statistics particularly frequency count, percentage, mean and standard deviation to describe the socio-demographic characteristics of the respondents. Pearson product moment correction and simple linear regression analysis were used to analyze and test the hypotheses at 0.05 level of significance.

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Results

Table 1: ***Socio-demographic Information of the Respondent.***

Variable	N	%	Mean	SD
Gender				
Male	131	34.1		
Female	253	65.9	1.66	.475
Total	384	100.0		
Age (in years)				
21-30	71	18.5		
31-40	112	29.2		
41-50	117	30.5	2.56	1.028
51 & above	84	21.9		
Total	384	100.0		
Educational Qualification				
NCE	79	20.6		
B.Ed	111	28.9		
PGDE	110	28.6	2.52	1.050
Masters'/PhD	84	21.9		
Total	384	100.0		
Years of Experience				
1-5	70	18.2		
6-10	111	28.9		
11-15	117	30.5	2.57	1.030
16 & above	86	22.4		
Total	384	100.0		
Received Training on AT				
Yes	144	37.5		
No	240	62.5	1.63	.485
Total	384	100.0		

The socio-demographic details of 384 respondents are shown in Table 1. The gender mean was 1.66 (SD =.475), with women making up the majority (65.9%) and men making up 34.1%. With a mean age group of 2.56 (SD = 1.028) and the largest age group (30.5%), the majority of responses were between the ages of 31 and 50, suggesting that the population was primarily middle-aged. The most common educational backgrounds were B.Ed. (28.9%) and PGDE (28.6%), closely followed by Master's/PhD (21.9%) and NCE (20.6%) holders. A well-educated sample is shown by the educational qualification mean of 2.52 (SD = 1.050). With a mean of 2.57 (SD = 1.030), the majority of respondents had either 11–15 years (30.5%) or 6–10 years (28.9%) of teaching experience, showing significant professional expertise. Remarkably, just 37.5% had assistive technology (AT) training, whilst 62.5% said they had not. The effective inclusion of students with hearing impairments may be impacted by the notable professional development gap regarding AT, as indicated by the mean of 1.63 (SD =.485). The workforce is generally well-educated and experienced, but as revealed by the data, AT training is desperately needed.

Table 2: ***Relationship between the Use of Assistive Technologies and the Level of Inclusive Classroom Management for Learners with HI***

Variable	N	Mean	SD	r	Sig.	Remark
Use of Assistive Technologies	384	34.70	4.756	.565	.000	Significant relationship exists
Level of Inclusive Classroom Management	384	35.45	5.389			

Table 2 presents the relationship that exists between the use of assistive technologies and level of inclusive classroom management for students with HI. It shows that use of assistive technologies (mean = 34.70; SD = 4.756) significantly correlated with level of inclusive classroom management for students with HI (Mean = 35.45; SD =5.389) with coefficient r = .565. Therefore, a significant relationship exists between the two constructs. Hypothesis 1 is therefore rejected.

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Table 3: ***Simple Regression showing the Influence of Teachers' proficiency in Using Assistive Technologies on Effectiveness of Classroom Management for Students with HI***

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	13.596	2.149	.008	6.328	.000
	Teacher proficiency	.814	.079	.464	10.235	.000

a. Dependent Variable: Classroom management

Table 3 is simple linear regression of the influence of teachers' proficiency in using assistive technologies on effectiveness of classroom management. It shows that at t = 10.235 indicating a significance influence with p-value = .000 less than .05 alpha level i.e. [t = 10.235, β = .464; p = .000 < .05]. It further shows that there is improvement in classroom management with teacher proficiency in use of assistive technologies as shown by the constant (t = 6.328, β = .008) when compared to 10.235. Hypothesis 2 is consequently rejected.

Table 4: ***Simple Regression showing the Influence of Availability of Assistive Technologies on academic participation of Students with HI***

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.171	.032	.265	5.364	.000
	AT Availability	20.921	1.116	.265	18.738	.000

a. Dependent Variable: Academic engagement

Table 4 is simple linear regression showing the influence of assistive technologies' availability on academic engagement of students with HI. It shows that at t = 20.921 indicating a significance influence with p-value = .000 less than .05 level of significance i.e. [t = 20.921, β = 18.738; p = .000 < .05]. It further shows that there is improvement in academic engagement of the students with availability of assistive technologies as shown by the constant (t = 5.364, β = .265) which is less than 20.921. Therefore, Hypothesis 3 is rejected.

Discussion

This study established that a significant positive relationship exists between the use of assistive technologies and the level of inclusive classroom management for learners with hearing impairment in Ibadan Metropolis. This finding corroborates Adeduyigbe et al. (2024) assistive technology promotes engagement and communication and helps teachers run more inclusive and efficient classrooms. Kalist et al. (2020) also established that the use of assistive technologies can enhance promote inclusive classroom, particularly for students with hearing impairment. Okoye et al. (2024 and Neves et al. (2024) similarly reported that assistive technologies reduce barriers to communication and enhances students' understanding and promotes engagement in a variety of learning atmosphere.

It was found that teachers' proficiency in using assistive technologies have significant influence on the effectiveness of classroom management for learners with hearing impairment. This means that teachers' level of competence in handling assistive technologies is crucial in promoting effective classroom management particularly for students with hearing impairment. The research finding of Philips et al. (2024) in which they reported that teachers with sufficient training and expertise in using these devices can interact with hearing-impaired students more successfully and modify their teaching strategies accordingly lend credence to this finding. Perez-Enriquez et al. (2024) equally found that teacher competency affects the creation of an inclusive classroom culture that is sensitive to a range of communication demands in addition to the seamless operation of assistive technology.

Results of the study also shows that availability of assistive technologies in schools has significant impact on the academic participation of learners with hearing impairment in Ibadan Metropolis. Similar finding by Okoye et al. (2024) had established that provision of assistive devices in schools influences academic engagement of students with hearing impairments. Asuncion et al. (2024) asserted that limited access to assistive technologies is a major impediment to inclusive education in schools and that this has been linked to hearing-impaired students' lower academic performance and less classroom participation. Other finding in support of this include Tumewu et al. (2024) who reported that availability of assistive technologies in schools improves understanding, interaction between the students and the teacher and enhances academic engagement of the students. Neves et al. (2024) emphasis that the use of assistive technology promotes engagement and academic success of students with hearing impairment.

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Conclusion

Based on the findings of the study, it can be concluded that the use of assistive technologies is crucial for promoting inclusive classroom management for students with hearing impairment. Equally important is teachers' proficiency in using assistive technologies have significant influence on the effectiveness of classroom management for students with hearing impairment. It can also be concluded that availability of assistive technologies in schools affects academic engagement of students with hearing impairment.

Recommendations

Stemming from the findings in this study, the following are recommended:

1. There is need for secondary schools and educational to provide and maintain a wide range of assistive technologies to support students with hearing impairment.
2. There should be regular in-service training and workshops for teachers to improve their proficiency in the use of assistive technologies.
3. Education stakeholders and government should plan and implement clear policies targeted as integrating assistive technologies in inclusive classrooms. This include adequate funding and financial allocation to support this initiative at all levels of education.

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