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Role Of Innovative Technologies in Social Integration of Students with Hearing Impairment in Inclusive Day Secondary School, Bosso, Niger State

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Abstract
This study investigated the role of innovative technologies in social integration of students with hearing impairment in inclusive Day Secondary School, Bosso, Niger State. The study adopted a descriptive survey research design and data were collected from 36 participants including 19 teachers and 17 students with hearing impairment. The findings revealed a significant non-availability of innovative technologies in the study area to support students with hearing impairment in their social integration and communication. The study identified several challenges faced by students with hearing impairment such as technical issues with assistive devices, inconsistent availability of resources, lack of training, and peer reluctance to engage with assistive technologies. The study recommends that the school prioritize the acquisition and implementation of innovative technologies, provide training for teachers and involve parents/guardians in the decision-making process. Policy makers should also develop and implement policies that support the use of innovative technologies in inclusive education.

Keywords: Inclusive Education, Innovative Technologies, Social Integration, Students, Hearing Impairment

Introduction

Innovative technologies are new or improved products or processes that are significantly different from what came before. Innovative technologies consist of a range of tools designed to support the learning and communication needs of students with hearing impairment. The incorporation of innovative technologies in learning environment has significantly transformed the role of teachers, especially in facilitating the education of students with hearing impairment. Assistive technologies, such as hearing aids, cochlear implants, and communication applications, play a crucial role in facilitating access to educational content and enhancing communication between students with hearing impairment and their peers and teachers (Johnson & Williams, 2020; Anderson & Davis, 2019). These technologies help reduce communication barriers, allowing students to participate more fully in classroom activities and social interactions. Furthermore, the integration of digital resources, such as captioning services and online learning platforms, has been shown to improve academic performance and language acquisition among hearing-impaired students (Jimenez-Arberas & Diez, 2021). Moreover, language acquisition tools and digital resources foster language development, helping students improve their reading and communication. However, challenges such as financial constraints and varying learner needs hinder the effective integration of personalized technology.

Social integration refers to the process through which individuals with disabilities, such as hearing impairment are included in social and educational settings alongside their peers. The use of innovative technologies significantly enhances social integration by providing students with hearing impairment with the tools they need to communicate effectively. For instance, mobile applications that facilitate real-time captioning or sign language

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translation can help these students engage more actively in group discussions and collaborative projects (Kim et al.,2024). This increased participation not only fosters a sense of belonging but also promotes positive social interactions, which are essential for the overall development of students with hearing impairment.

Over the past two decades, the education of children with special educational needs (SEN) in Nigeria has evolved significantly, moving from segregation to inclusion in mainstream classrooms due to parental dissatisfaction with previous practices (NCSE, 2010). The concept of Inclusive Education (IE) emphasizes that all children, regardless of ability or disability should be educated together, aligning with the United Nations' declaration of inclusive education as a human right (UN, 2006). Today, there is a strong focus on creating inclusive learning environment that cater to diverse student needs, reflecting a broader commitment to educational equity (Griffin & Shevlin, 2011). Inclusive education is an educational philosophy that advocates for the inclusion of all students, regardless of their abilities or disabilities in mainstream classrooms. The role of innovative technologies in inclusive education is pivotal, as they provide the necessary support for students with hearing impairment to thrive in such environment.

Students with hearing impairment are defined as individuals who experience a significant reduction in their ability to hear, which can adversely affect their educational performance. According to the Individuals with Disabilities Education Act (IDEA, 2004), hearing impairment is described as "an impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance". This definition encompasses a range of hearing losses, from mild to profound, and includes students who may use hearing aids or other assistive technologies to facilitate communication and learning. Accessibility remains a critical concern and the implementation of universal design principles can help ensure that educational technologies are usable by all students including those who are deaf (Burgstahler, 2019). Nevertheless, issues of digital inequality and the limited preparation of teachers for utilizing modern technology persist (Edyburn, 2020). There is a lack of awareness and funding for professional development programmes aimed at equipping educators with the skills necessary to effectively incorporate innovative technologies into their teaching practices. This research paper examines how innovative technologies have enhance social integration for students with hearing impairment within inclusive educational settings in Day Secondary School, Bosso, Niger State.

Statement of the Problem

Despite the potential of innovative technologies to enhance social integration and academic performance for students with hearing impairments in inclusive educational settings, significant barriers remain. Issues such as digital inequality, insufficient teacher preparation, and a lack of awareness and funding for professional development programmes hinder the effective implementation of these technologies in Day Secondary School, Bosso, Niger State. Consequently, there is an urgent need to investigate how these challenges affect the educational experiences of students with hearing impairment and to identify strategies for promoting their successful integration in mainstream classrooms.

Objectives of the Study

The main aim of this study is to determine the role of innovative technologies in enhancing social integration for students with hearing impairment in inclusive education in Day Secondary School, Bosso, Niger State. Specific objectives include to:

1. find out the availability of innovative technologies that support social interactions of students with hearing impairment in Day Secondary School, Bosso LGA.
2. investigate how innovative technologies influence social integration of students with hearing impairment in inclusive Day Secondary School, Bosso LGA.
3. examine the impact of assistive technologies on communication and interaction between students with hearing impairments and their peers in classrooms.
4. identify the challenges faced by students in the use of innovative technologies in inclusive classrooms.
5. find out the teacher and students perception of the role of technology in social integration.

Research Questions

1. What is the availability of innovative technologies in supporting social interactions of students with hearing impairment in Day Secondary School, Bosso LGA?
2. How do innovative technologies facilitate social integration for students with hearing impairment in inclusive educational settings in Day Secondary School, Bosso LGA?

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3. What is the impact of assistive technologies on communication and interaction between students with hearing impairment and their peers in classrooms?
4. What challenges do students with hearing impairments face in the use of innovative technologies in inclusive classrooms?
5. What are the perceptions of teachers and students about the role of innovative technology in social integration?

Method and Procedure

Design

This study adopted a descriptive type, which employ survey research design to appropriately address the purpose for which it was intended. The design also provides opportunity for full, rich and deep descriptions of the topic of study. The subjective views and experiences of the teachers and students with visual impairment were perceived as vital in understanding how the innovative technologies in social integration of students with hearing impairment in inclusive Day Secondary School in Bosso LGA, Niger State.

Population and Sample

The population of the study was drawn from inclusive Day Secondary Schools in Bosso Local Government Area, Niger State, consisting of 19 teachers and 17 students with hearing impairment, making a total of 36 respondents. Since the population was small and manageable, the entire group was used as the sample, hence no sampling technique was applied.

Instrumentation

Data collection instruments are the tools used to collect research data. For the purpose of this study, the researchers used structured questionnaire as well as a checklist to collect data from the respective participants. Questionnaire as an instrument for data collection was researchers' developed questionnaire titled: Innovative Technologies and Social Integration of Students with Hearing Impairment in Inclusive Day Secondary School (ITSIDSSHI). The questionnaire had two parts (A and B). Part A contained information on personal data of the teachers and students with hearing impairment, while in part B, both students and teachers were requested to respond to 15 items using Likert's four-point scale in four clusters, A, B and C of research questions two, three and four. The checklist used research question one for determination of innovative technologies that are available for students with hearing impairment in supporting their social interactions. A list of ten (10) items were presented to ascertain their availability. The rating scale were available and not available. This was used to measure the equipment that can promote social integration in the study area. The instrument was validated by two experts in the Department of Special Education and Measurement and Evaluation in Niger State College of Education, Minna, who reviewed the items to ensure clarity and relevance with the study objectives.

Data Analysis

Quantitative data from structured questionnaire items were analyzed using descriptive statistics with the aid of Statistical Package for Social Sciences (SPSS). Mean was used to answer the research questions two to four while simple percentage was used for research question one.

Results

Table 1: Respondents' Responses Regarding Availability of innovative technologies in supporting social interactions

S/N		Available	Not Available
1	Hearing aids	25 (69.44%)	11 (30.56%)
2	FM systems (Frequency Modulation systems)	10 (27.78%)	26 (72.22%)
3	3. Sign language interpretation services	8 (22.22%)	28 (77.78%)
4	4. Speech-to-text software	9 (25.00%)	27 (75.00%)
5	Mobile apps for communication	7 (19.44%)	29 (80.56%)
6	Visual alert systems (e.g., flashing lights)	10 (27.78%)	26 (72.22%)
7	Tablets with accessibility apps	6 (16.67%)	30 (83.33%)
8	Communication boards	18 (50.00%)	18 (50.00%)
9	Closed captioning for videos	5 (13.89%)	31 (86.11%)
10	Online forums for peer interaction	4 (11.11%)	32 (88.89%)
11	Group chat applications	3 (8.33%)	33 (91.67%)
12	Real-time captioning services	2 (5.56%)	34 (94.44%)
13	Video relay services	1 (2.78%)	35 (97.22%)

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14	Assistive listening devices	20 (55.56%)	16 (44.44%)
15	Augmented reality applications	3 (8.33%)	33 (91.67%)

Table 1 shows that hearing aids were the most available technology (69.44%) for students with hearing impairment in Bosso LGA. Assistive listening devices were also relatively available (55.56%). However, sign language interpretation services (22.22%) and mobile apps (19.44%) had low availability. Resources like closed captioning (13.89%) and video relay services (2.78%) were the least accessible.

Table 2: Respondents' Responses on the extent Innovative Technologies Facilitate Social Integration

S/N	Statement	SA	A	D	SD	$\bar{X}$
16	Innovative technologies improve communication among students with hearing impairment.	12	15	6	3	3.25
17	Use of assistive devices encourages collaboration in group activities.	10	18	5	3	3.14
18	Social media and communication apps cannot enhance peer interactions.	5	6	12	13	2.11
19	Visual alert systems promote participation in school events.	14	16	4	2	3.44
20	Training on innovative technologies increases teachers' effectiveness in supporting students.	11	17	6	2	3.19

Table 2 reveals that innovative technologies facilitate social integration for students with hearing impairment in Bosso LGA. Items 16–20 with mean scores of 3.25, 3.14, 3.44 and 3.19 (all above 2.50) show that they improve communication, encourage collaboration, promote participation, and enhance teachers' effectiveness. The findings indicate that assistive devices and visual alert systems are particularly supportive. However, the statement that social media and communication apps cannot enhance peer interaction was rejected with a mean score of 2.11 (below 2.50).

Table 3: Respondents' Responses Regarding the Impact of Assistive Technologies on Communication and Interaction.

S/N	Statement	SA	A	D	SD	$\bar{X}$
21	Assistive technologies cannot enhance understanding of classroom discussions.	5	6	12	13	2.11
22	Communication devices promote more frequent interactions with peers.	14	15	5	2	3.31
23	Use of assistive technologies reduces feelings of isolation among students with hearing impairment.	13	17	5	1	3.25
24	Peer collaboration is improved through the use of communication aids.	12	16	6	2	3.14
25	Assistive technologies cannot help bridge communication gaps in group activities.	6	7	15	8	2.39

Table 3 shows mean scores of 3.31, 3.24 and 3.14 (items 22, 23, 24) above 2.50, indicating positive impact of assistive technologies on communication and peer interaction. These technologies promote frequent interactions, reduce isolation, and improve collaboration. However, items 21 (2.11) and 25 (2.39) fell below 2.50, showing disagreement that assistive technologies cannot enhance classroom understanding and group communication.

Table 4: Respondents' Responses on Challenges Students with Hearing Impairment Face in the use of Innovative Technologies.

S/N	Statement	SA	A	D	SD	$\bar{X}$
26	Lack of training on assistive technologies hinders effective use.	10	13	6	7	2.72
27	Technical issues with devices create barriers to communication.	12	18	4	2	3.31
28	Insufficient access to innovative technologies cannot limit participation.	4	5	15	12	2.00
29	Peer reluctance to engage with assistive technologies affects interaction.	12	9	9	6	2.75

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30	Inconsistent availability of resources affects learning outcomes.	11	20	4	1	3.25

Table 4 shows that items 26 (2.72), 27 (3.31), 29 (2.75) and 30 (3.25) were accepted. However, item 28 (2.00) on insufficient access limiting participation and item 29 (2.75) on peer reluctance to engage were rejected as significant challenges. This suggests that the major barriers are device-related issues, resource availability, and inadequate training.

Table 5: Respondents' Responses on Perceptions of Teachers and Students about the Role of Innovative Technology in Social Integration.

S/N	Statement	SA	A	D	SD	$\bar{X}$
31	It improves communication between students with and without hearing impairment.	10	13	6	7	2.72
32	Assistive devices encourage collaboration and participation in group activities.	12	18	4	2	3.11
33	|Captioning services help students with hearing impairment engage in school events.	12	15	5	4	2.97
34	Training on innovative technologies enhances teachers' ability to support inclusive education.	12	9	9	6	2.75
35	The use of social media platforms promotes peer interaction and reduces isolation.	11	20	4	1	3.14

Table 5 indicates that all the items had mean scores above the criterion mean score of 2.50, showing they were accepted by the respondents. Item 31 had a mean score of 2.72, item 32 had 3.11, item 33 had 2.97, item 34 had 2.75 and item 35 had 3.14. This implies that innovative technologies are perceived as playing a significant role in improving communication, collaboration, participation and social interaction among students with hearing impairment.

Discussion

The findings revealed a concerning on the availability of innovative technologies in supporting social interactions for students with hearing impairment in Day Secondary School Bosso Local Government Area, Niger State. The findings show that, despite the school's inclusive status, many essential innovative technologies are lacking, hindering communication and social integration of students with hearing impairment. While hearing aids and assistive listening devices are available, they are insufficient to meet the diverse needs of the 17 students. The absence of tools like FM systems, sign language services, speech-to-text software and visual alert systems highlights a major gap for inclusivity. The finding of states that Olaosun & Ogundiran (2013) aligned with this study that, the technology currently use today in supporting students with hearing impairment is application designed to convert into text, speech to video sign language or computer generated voice, text to computer generated voice. Sadly, this has not been made available for students with hearing impairment in the study area to support their social interaction with peers and teachers. It is necessary to develop innovative technology that can assist students with hearing impairment to more easily receive information from their teachers or classmates at ease.

The study investigated how innovative technologies influence social integration of students with hearing impairment in inclusive Day Secondary School, Bosso LGA. The findings showed that innovative technologies enhance social integration of students with hearing impairment. They improve communication, collaboration, and participation in school activities. Assistive devices and teacher training were found effective. Respondents also agreed that social media platforms like Zoom, WhatsApp, and YouTube support peer interaction. The result of Burgstahler (2019) founded on the principles of inclusive educational technology and seeks to create products and environments that are effectively usable by individuals with diverse disabilities. Edyburn (2020) similarly agreed that interactive captioning and sign language interpretation are crucial for ensuring equal educational opportunities. Captions benefit all learners by enhancing comprehension, while sign language supports access to content based on the preferred communication methods of learners.

The study examined the impact of assistive technologies on communication and interaction between students with hearing impairment and their peers in classrooms. The findings revealed that assistive technologies positively influenced communication and interaction among students with hearing impairment. FM systems and hearing aids promoted more frequent interactions with classmates, while hearing aids also enabled active participation in group

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activities without necessarily depending on sign language interpreters. The study further showed that speech-to-text software is essential for peer collaboration, though it was not available despite its importance in group projects. Additionally, assistive technologies were found to reduce feelings of isolation, helping students communicate more effectively with their peers and participate more fully in classroom activities. The findings of Halpin (2021) agreed that innovative technology is beneficial to individuals with hearing impairment as it removes barriers and improves the overall quality of life in everyday settings–whether at home, at work, in a learning environment or social interactions. Halpin further explained that innovative technology is essential but not meant to address a disability. It is meant in bridging communication gaps to make individuals feel more connected in previously challenging situations.

The findings showed the challenges students with hearing impairments face in the use of innovative technologies in inclusive classrooms in Day Secondary School, Bosso Local Government Area, Niger State. The findings showed that students with hearing impairment faced challenges such as technical issues with hearing aids, inconsistent availability of resources like tablets with speech-to-text software, and lack of training on assistive technologies. Peer reluctance to engage with assistive devices also limited interaction and relationships. However, insufficient access to innovative technologies was not considered a major challenge, likely because such technologies were generally unavailable in the study area. The challenges we found are consistent with other researchers such as Rehman et al. (2024) whose study revealed that a large portion of respondents indicated their concerns about the inadequate availability of specialized personal assistive devices, the access of untrained individuals to materials and tools and the impact of limited financial resources and lack of responsiveness from teachers and school administrators and other overarching challenges within the educational system.

The findings showed that innovative technologies are perceived as essential in enhancing communication between students with and without hearing impairment encouraging collaboration and participation in group activities, and supporting engagement in school events. The results also revealed that training on innovative technologies improves teachers' ability to support inclusive education while the use of social media platforms promotes peer interaction and reduces isolation. This study agrees with the view of Okeke and Lawal (2020) that innovative and assistive technologies play a significant role in improving communication and fostering social inclusion among learners with special needs.

Conclusion

The study revealed that non-availability of essential innovative technologies such as Frequency Modulation systems, sign language interpretation services and speech-to-text software severely hinders the education of students with hearing impairment in Day Secondary School Bosso Local Government Area, Niger State. This has limited access to equal social interaction to an extent among students with hearing impairment and their peers. Despite the school's inclusive status, there is a concerning lack of innovative technologies to support students with hearing impairment hindering their social integration and communication. The findings expressed the importance of innovative technologies in facilitating social integration in the area of improved communication and equal access to education for students with hearing impairment. The school's inability to provide innovative technologies raises questions about its commitment to inclusivity. The study concluded that students with hearing impairment in the study area faced several challenges including technical issues with assistive devices, inconsistent availability of resources, lack of training and peer reluctance to engage with assistive technologies. This calls the need for increased commitment to inclusivity and provision of innovative technologies to support social integration and equal opportunities.

Recommendations

1. The school head should prioritize the acquisition and implementation of innovative technologies to support students with hearing impairment.
2. Teachers should receive training on how to effectively use innovative technologies to support students with hearing impairment into their classroom and promote peer interaction and collaboration.
3. Policy makers should develop and implement policies that support the use of innovative technologies in inclusive education covering all categories of learners
4. Parents/guardians of students with hearing impairment should be involved in the decision-making process regarding the use of innovative technologies in the classroom. They should also receive training and support on how to use these technologies to support their child's learning and communication at home.

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