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EXPLORING THE EFFECT OF INCLUSIVE TECHNOLOGIES ON LEARNING OUTCOMES OF DIFFERENTLY ABLED PERSONS IN UNIVERSITY LIBRARIES IN NORTH EAST, NIGERIA

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Abstract
This study explores the effect of inclusive technologies on the learning outcomes of differently-abled persons in university libraries across North-East Nigeria. The study population includes 350 differently-abled students and 50 library staff from five university libraries: University of Maiduguri, Abubakar Tafawa Balewa University, Modibbo Adama University, Taraba State University, and Gombe State University. Using a mixed-methods approach, data were collected through surveys, structured interviews, and observation. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative insights were analyzed thematically. The findings reveal that inclusive technologies, such as screen readers, braille materials, and assistive software, significantly enhance access to learning resources and improve academic performance among differently-abled students. However, challenges such as inadequate funding, inadequate staff training, and poor maintenance of assistive devices hinder their effective utilization. The study concludes that inclusive technologies have a transformative impact on the learning experiences of differently-abled students when adequately implemented and supported. The study recommends increased funding for acquiring and maintaining inclusive technologies, regular training programmes for library staff, and the development of comprehensive policies that prioritize inclusivity. Collaborative efforts among universities, government bodies, and non-governmental organizations are also emphasized to address systemic challenges and promote equitable access to education.
Keywords: Inclusive Technologies, University libraries, Learning outcomes, North-East Nigeria.

Introduction

In the contemporary educational setting, the significance of inclusive technologies has become increasingly recognized, particularly regarding their impact on differently abled individuals. As universities strive to foster equitable learning environments, it is important to understand how these technologies affect the learning outcomes of students with disabilities. This study focuses on the role of inclusive technologies within university libraries in North East Nigeria, aiming to explore their effects on various means of learning and user experience. Inclusive technologies encompass a range of tools designed to facilitate access to educational resources for students with disabilities. These technologies include screen readers, text-to-speech software, and other assistive devices that enable students to engage with academic materials effectively.

The Global Education Monitoring Report (2023) highlights that assistive technologies not only improve educational outcomes but also foster self-esteem and independence among learners with disabilities. However, obstacles such as inadequate training and lack of access to resources remain significant challenges. Access to inclusive technologies is a fundamental variable in this research. It encompasses the availability, usability, and effectiveness of assistive devices and software that facilitate learning for differently abled students. In the North East Nigeria, where access to educational resources may be inadequate, the importance of access to inclusive technologies is crucial for evaluating their potential impact on learning outcomes.

User satisfaction remains a critical factor influencing the overall effectiveness of inclusive technologies. Morris and Burch (2020) observed that user satisfaction are positively correlated with increased library usage and improved academic performance. For differently abled students therefore, satisfaction can stem from various aspects of library services, including the availability of trained library staff who can assist in using assistive technologies and the physical accessibility of library spaces. Kumar and Kumar (2019) averred that when libraries actively solicit feedback from users and make necessary adjustments based on that feedback, user satisfaction increases significantly.

This paper therefore, seeks to contribute to the existing body of knowledge by providing a comprehensive analysis of how inclusive technologies influence learning outcomes for differently abled persons in university libraries in North East Nigeria. By examining variables such as access to technology, user satisfaction, academic performance outcomes, digital literacy skills, and perceived barriers, this study seeks to offer valuable recommendations for enhancing library services and promoting inclusivity in higher education.

Statement of the Problem

The integration of inclusive technologies in education has emerged as an essential factor in enhancing the learning experiences of differently abled individuals. However, despite advancements in technology and increased awareness surrounding inclusive education, students with disabilities in university libraries across North East Nigeria continue to face significant challenges that impede their academic performance and overall educational experience. In North East Nigeria, where educational resources are often scarce, this issue is particularly pronounced, leading to disparities in educational attainment between differently abled students and their peers without disabilities. Furthermore, **user satisfaction with library services** remains a critical concern. Differently abled students often report dissatisfaction with library services due to

inadequate support and lack of trained personnel who can assist them in utilizing available technologies effectively (Morris & Burch, 2020). This dissatisfaction can lead to decreased usage of library resources, further worsening the academic challenges faced by these students. Factors such as inadequate access to inclusive technologies, inadequate support services, and societal attitudes towards disabilities can significantly influence academic performance. This study therefore, seeks to explore the effects of inclusive technologies on learning outcomes for differently abled persons in university libraries in North East Nigeria by investigating access to technology, user satisfaction with library services, academic performance outcomes, digital literacy skills, and perceived obstacles to technology use.

Objectives of the Study

The primary purpose of this study is to explore the effects of inclusive technologies on the learning outcomes of differently abled persons in university libraries in North East Nigeria. Specifically, the study intends to:

1. Assess the current state of access to inclusive technologies within university libraries.
2. Measure user satisfaction among differently abled students regarding library services and resources.
3. Examine the relationship between the use of inclusive technologies and academic performance outcomes for differently abled students.
4. Evaluate the digital literacy skills of differently abled students in relation to their ability to utilize inclusive technologies effectively.
5. Identify perceived obstacles that differently abled students face when using inclusive technologies in university libraries.

Research Questions

The follow research questions are aimed at guiding the study.

1. What is the level of access to inclusive technologies available to differently abled students in university libraries in North East Nigeria?
2. How satisfied are differently abled students with the library services and resources provided in relation to inclusive technologies?
3. What is the relationship between the use of inclusive technologies and academic performance outcomes for differently abled students in university libraries?
4. How proficient are differently abled students in digital literacy skills related to using inclusive technologies in university libraries?
5. What perceived obstacles do differently abled students encounter when using inclusive technologies in university libraries, and how do these barriers affect their learning outcomes?

Review of Related Literature

In exploring the effect of inclusive technologies on the learning outcomes of differently-abled persons in university libraries in North East Nigeria, a robust conceptual framework is essential. This framework will integrate main modules that influence the relationship between inclusive technologies and learning outcomes, focusing on the interaction between technology, learners, educational practices, and institutional support.

Current state of access to inclusive technologies

Access to inclusive technologies is fundamental for enabling differently abled students to participate fully in educational settings, particularly in university libraries. These technologies encompass a wide range of assistive devices and software that enhance learning opportunities and facilitate academic engagement. Fernández-Batanero et al. (2022) averred that assistive technologies promote inclusion and accessibility, which are essential for improving academic engagement and performance among differently-abled students. The World Health Organization (2016) inclusive technologies are designed to access such technologies is essential for achieving equitable educational outcomes, as they empower students to engage with the curriculum effectively. Fernández-Batanero et al. (2022) conducted a systematic review examining the impact of assistive technology (AT) on the inclusion of students with disabilities in educational settings. The review analyzed 31 studies published between 2009 and 2020 and found that AT significantly enhances accessibility and inclusion for these students. However, it also identified obstacles such as insufficient teacher training and lack of information about available technologies (Fernández-Batanero et al., 2022). Lindsay et al. (2016) explored the relationship between assistive technology use and academic performance among students with disabilities in higher education. Their findings indicated that access to AT not only improved academic engagement but also contributed positively to self-esteem and social participation. The study highlighted that effective implementation of AT requires ongoing support and training for both students and educators.

Satisfaction among differently abled students regarding library services and resources.

User satisfaction is a critical metric for assessing the quality of library services, particularly in academic settings. It encompasses users' perceptions of the library's resources, services, facilities, and staff interactions. Zhang et al. (2021) evaluated user satisfaction with academic library services at Jiangsu University. Utilizing a survey method, the researchers collected data from 283 international students. The findings revealed that users were generally satisfied with the library's support for learning and research. However, some users expressed dissatisfaction regarding specific aspects of service delivery. The study concluded that continuous evaluation of user satisfaction is necessary to enhance service quality and meet evolving user needs. In a related study in user satisfaction at the open university of Sri Lanka. Perera, et al. (2020), assessed user satisfaction with library resources and services at the Open University of Sri Lanka. The survey included 357 respondents, comprising both staff and students. Results indicated that users were most satisfied with library staff performance but identified areas needing improvement, such as user awareness programs and access to electronic databases. The study emphasized the importance of conducting regular surveys to align library services with user expectations.

Adeniran (2020) investigated user satisfaction with academic library services at Redeemer's University in Nigeria. The study utilized a questionnaire to gather data from both academic staff and students. Findings indicated that while users were generally satisfied with library services, there was a need for improvement in specific areas such as resource availability and staff responsiveness. The author recommended enhancing communication with users to better understand their needs.

Inclusive technologies and academic performance outcomes for differently abled students.

Academic performance outcomes are critical indicators of educational success and are typically measured through metrics such as grade point averages (GPA), test scores, and graduation rates. Numerous factors influence these outcomes, including personal characteristics, environmental conditions, and institutional support. Recent empirical studies have provided valuable insights into the determinants of academic performance, particularly in the context of higher education. According to Mohammed and Abdallah (2023) academic performance serves as a key indicator of a student's ability to master course content and succeed in their field of study. High academic achievement is often associated with better job prospects and career advancement opportunities. Zhang et al. (2021) observed that good academic performance can enhance students' self-esteem and confidence, positively impacting their overall well-being. Bakar et al. (2023) **pointed out that a**cademic outcomes can predict future educational attainment and success in professional life, making it essential for educational institutions to understand and improve these outcomes.

Mohammed and Abdallah (2023) assessed how residential status affects students' academic performance at Prince Sattam Bin Abdulaziz University in Saudi Arabia. The study revealed that students living on campus performed better academically than those living off-campus due to increased access to resources and support services. Academic performance outcomes therefore, are influenced by a complex interplay of personal attributes, environmental conditions, and institutional support mechanisms.

Digital literacy skills of differently abled students

Digital literacy skills encompass the abilities required to effectively navigate, evaluate, and create information using digital technologies. These skills are increasingly vital in today's educational landscape, where technology plays a central role in learning and communication. Digital literacy includes a range of competencies, such as information literacy, communication skills, and the ability to utilize various digital tools and platforms. Digital literacy fosters lifelong learning by equipping individuals with the skills needed to adapt to new technologies and information sources throughout their lives (Campbell & Kapp, 2020).

The following studies support the importance of digital literacy; Olaniyan et al. (2022) examined the influence of digital literacy skills on academic engagement among Library and Information Science students in Nigeria. The research found a significant positive correlation between digital literacy skills and academic engagement, indicating that higher levels of digital literacy lead to increased participation in academic activities. The study revealed that information literacy, communication skills, and problem-solving abilities were particularly influential in enhancing students' academic engagement. While Botturi (2019) explored the effectiveness of a specific training program aimed at enhancing digital literacy among future educators at a university level. The study involved pre- and post-intervention assessments that demonstrated significant improvements in participants' digital content creation skills and their confidence in using various digital tools for educational purposes.

Campbell and Kapp (2020) conducted a study focusing on the relationship between digital literacy skills and academic performance among university students in education programs. Their findings indicated that students who received training in digital literacy showed significant

improvements in their academic performance compared to those who did not receive such training. As technology continues to evolve, it is crucial for educational institutions, especially the libraries, to prioritize the development of comprehensive digital literacy programs that equip students with the necessary competencies for success in both their academic endeavors and future careers.

Perceived obstacles that differently abled students face

Perceived obstacles to technology use refer to the obstacles that individuals encounter when attempting to integrate technology into their educational practices or daily activities. These barriers can be categorized into internal (personal beliefs, attitudes) and external (institutional support, infrastructure) factors. Understanding these barriers is essential for developing strategies to enhance technology integration in educational settings. Identifying perceived obstacles allows educators and policymakers to create targeted interventions that facilitate the effective use of technology in teaching and learning environments. Recognizing the specific obstacles faced by educators. However, internal beliefs about technology remained a persistent challenge for many educators.

Research Methodology

This research aims to investigate how inclusive technologies impact the learning outcomes of differently abled individuals in university libraries in North East Nigeria. A mixed-methods research design was employed, combining quantitative and qualitative approaches. To allows for a comprehensive understanding of the impact of inclusive technologies by quantifying user experiences and satisfaction while also exploring deeper insights through interviews and focus groups.

Data Analysis

Table 1: Level of Access to Inclusive Technologies in University Libraries (Research Question 1)

Access Level (Likert Scale)	Frequency	Percentage (%)
Very High	12	10.0%
High	28	23.3%
Moderate	34	28.3%
Low	30	25.0%
Very Low	16	13.3%
Total	**120**	**100%**

Interpretation: Most respondents (53.3%) rated access as moderate to low, suggesting that access to inclusive technologies in university libraries is inadequate.

Table 2: Satisfaction with Inclusive Technology Services

Satisfaction Level	Frequency	Percentage (%)
Very Satisfied	10	8.3%
Satisfied	24	20.0%
Neutral	30	25.0%
Dissatisfied	36	30.0%
Very Dissatisfied	20	16.7%
Total	**120**	**100%**

Interpretation: A total of 46.7% of respondents expressed dissatisfaction, showing a need to improve service quality related to inclusive technologies.

Table 3: Correlation between Use of Inclusive Technologies and Academic Performance

Variable 1	Variable 2	Pearson r	p-value	Significance
Use of Inclusive Tech	Academic Performance	0.61	0.001	Significant

Interpretation: There is a **strong positive correlation** ($r = 0.61$, $p < 0.01$) between use of inclusive technologies and academic performance outcomes.

Table 4: Digital Literacy Proficiency in Using Inclusive Technologies=

Proficiency Level	Frequency	Percentage (%)
Very High	14	11.7%
High	26	21.7%
Moderate	38	31.7%
Low	28	23.3%
Very Low	14	11.7%
Total	**120**	**100%**

Interpretation: A combined 35% rated themselves as having low or very low digital literacy, indicating a gap in the ability to use inclusive technologies effectively

Table 5: Perceived Barriers and Their Effect on Learning Outcomes

Obstacle Type	Frequency	Percentage (%)
Inadequate Devices	32	26.7%
Lack of Training	28	23.3%
Poor Internet Connectivity	20	16.7%
Negative Attitude of Staff	18	15.0%
Non-availability of Assistive Software	22	18.3%
Total	**120**	**100%**

Discussion of Findings

The findings of this study provide important understandings into the availability, use, and impact of inclusive technologies on the learning experiences of differently abled students in university libraries across North East Nigeria.

Level of Access to Inclusive Technologies: The results indicate that a majority of respondents (53.3%) rated their access to inclusive technologies as either moderate or low. This finding suggests that university libraries in the region have not yet fully implemented or prioritized inclusive technology infrastructure. This aligns with studies such as Aina and Tella (2021), which revealed that many Nigerian academic libraries still face funding and policy-related challenges in supporting disability-inclusive digital environments.

User Satisfaction with Inclusive Services: Respondents showed mixed feelings about the services offered, with 46.7% expressing dissatisfaction. This dissatisfaction likely stems from inadequate availability of assistive devices, limited staff support, and lack of personalization in service delivery. The findings mirror previous research by Eze and Ibegbulam (2019), which identified low satisfaction among differently abled users due to poor service design and lack of awareness.

A statistically significant positive correlation ($r = 0.61$, $p < 0.01$) was found between the use of inclusive technologies and academic performance. This suggests that the more frequently and effectively differently abled students utilize assistive technologies, the better their academic outcomes. This supports the assertion by Mtebe and Raisamo (2016) that inclusive digital tools enhance access to information, learning independence, and academic success. Digital Literacy Proficiency of Differently Abled Students. Digital literacy among differently abled students was moderate overall, with 35% reporting low or very low proficiency. This finding raises concerns about the preparedness of students to independently utilize available technologies. It suggests a gap in digital skills training, and points to the need for structured capacity-building efforts within university support systems. Perceived hurdle and their effects on learning outcomes: Barriers identified include inadequate assistive devices (26.7%), lack of training (23.3%), and poor internet access (16.7%).

Conclusion

The study concludes that inclusive technologies play a vital role in enhancing learning outcomes for differently-abled persons in university libraries in North East Nigeria. Access to these technologies is associated with higher academic performance, increased user satisfaction, and improved digital literacy skills. However, perceived hurdles still exist, stressing the need for ongoing efforts to address these challenges.

Recommendations

1. Universities should invest in a wider range of assistive technologies and ensure they are readily available in library settings to support differently-abled students effectively.
2. Institutions should develop structured training programs aimed at improving digital literacy skills among differently-abled students, enabling them to utilize available technologies more effectively.

3. Continuous professional development for library staff on the needs of differently-abled learners and how to support them through inclusive practices is essential.

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