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1. Manuscripts should be original, and has not been published previously. Do not submit material that is currently being submitted to another journal.
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6. The paper format should be organised in the following order: Introduction, Statement of the Problem, Purpose of the Study, Research Questions, Methodology/Materials and Methods, Results, Major Findings, Discussions, Conclusion, Recommendations, References and Appendices (if any).
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EDITORIAL

The Annals of Technology Education Practitioners Association of Nigeria (ATEPAN) is the official journal of Technology Education Practitioners Association of Nigeria (formerly, Nigerian Association of Teachers of Technology, NATT). The journal aims at disseminating information on Teacher Education in Science, Technology, Engineering and Mathematics as it publishes original empirical and theoretical studies and analyses in education that constitute significant contributions to the improvement of educational processes and outcomes within the scope of our mandate and vision.

The purpose of the journal is to serve as a forum for researchers and other stakeholders to discuss common concerns in science, technology, engineering and mathematics (STEM) education at local, national or transnational levels. The journal has a distinguished editorial board with extensive academic qualifications, ensuring that the journal will maintain high scientific standards and have a broad professional coverage. The journal is an invaluable resource for teachers, counsellors, supervisors, administrators, curriculum planners, and educational researchers as well as students. ATEPAN consolidates the gains of its predecessor: JONATT in its regular quarterly appearance, increasing demand and widespread acceptability across the nation. However, article can be submitted anytime of the year, hence they are reviewed as received in continuum and feedback sent to authors promptly. After the review process and subject to meeting the Terms of Acceptance, articles will be published immediately in the next issue of the journal. ATEPAN Special Issue is normally released as a collection of selected papers presented at the Annual National Conference of TEPAN. Every Special Issue focuses on the conference theme of that year. Topics of recent themes include TVET and Sustainable Development, National Security, and Entrepreneurship.

I have the pleasure to present to you and on behalf of the Editorial Board the Annals of Technology Education Practitioners Association of Nigeria, ATEPAN Volume 8 Issue 4 (December, 2025). This edition features high-quality scientific articles selected through a double-blind peer review process cut across the areas of teacher education, teaching methods, technologies and innovations, and issues in quality assurance and policies. We most sincerely express our gratitude to all our sponsors and other stakeholders for partnering with TEPAN to harness our collective educational and industrial experiences in Nigeria. Finally, I wish to thank all those who submitted their papers and my special thanks go to the journal Reviewers and Editorial Advisory for their valuable time and effort.

Thank you.

Prof. A. M. Hassan
Editor – in – Chief

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EFFECT OF AUDIOBOOK APPLICATIONS ON VISUALLY IMPAIRED STUDENTS: PRACTICAL INSIGHTS FOR NIGERIA

A. Sadiku, Z. A. Evuti, I. I. Kuta, F. M. Sobowale & A. Fati.
Educational Technology Department, School of Science and Technology Education, Federal University of Technology, Minna Niger State.
Email: sadiku.abdul@futminna.edu.ng (Tel: +2347064923332)

Abstract: *The integration of assistive technologies such as audiobook applications has the potential to revolutionize the learning experience for virtually impaired students in Nigeria this is because visually impaired students in Nigeria face significant barriers to effective learning due to limited access to accessible instructional materials. This study examined the effect of an audiobook application on the academic achievement of visually impaired Junior Secondary School students in Computer Studies within Minna Metropolis, Niger State, Nigeria. A sequential explanatory mixed-methods design was employed, beginning with a qualitative needs assessment through semi-structured interviews with students, teachers, and special education experts (n=15), followed by a quasi-experimental pre-test post-test control group design. The population comprised all visually impaired students in the study area, with a purposive sample of 34 participants assigned to experimental (n=20) and control (n=14) groups. Validated and reliable researcher-developed instruments were used for data collection. Thematic analysis of qualitative data revealed critical learning challenges, such as the inaccessibility of visual content and overreliance on teacher dictation, justifying the need for the intervention. Quantitative analysis using an independent samples t-test indicated that students exposed to audiobook instruction achieved a significantly higher mean gain score (13.45) compared to the control group (2.29), with a statistically significant difference in post-test scores ($t(32) = -9.99$, $p < 0.05$). The study concludes that the audiobook application significantly enhances academic achievement by providing accessible, auditory-based learning support. It recommends integrating such assistive technologies into teaching practices and curricula to improve inclusivity and learning outcomes, offering practical insights for educational implementation in Nigeria.*

Key words*: Audiobook, Visual Impairment, Academic Achievement, Retention, Engagement, Assistive Technology.*

Introduction

Education remains the foundation of human and national development, promoting economic progress, social inclusion, and individual empowerment (UNESCO, 2017). However, students with disabilities, particularly those with visual impairments, often face barriers that limit their access to quality education (Okoye & Okechukwu, 2019). In Nigeria, these challenges include inadequate instructional materials, poorly trained teachers, and limited use of assistive technologies. Inclusive Education (IE) seeks to address these challenges by ensuring that all learners regardless of ability receive equitable educational opportunities. Despite policy commitments, the practical implementation of inclusive education remains weak in many Nigerian schools. Visually impaired students struggle particularly in subjects such as Computer Studies that depend heavily on visual demonstrations, diagrams, and abstract digital concepts (Downey & Snyder, 2020).

In a study conducted by Moore and Cahill (2016), lack of accessible materials hinders comprehension, retention, and academic engagement. The situation often forces visually impaired students to rely on teacher's dictation or peer explanations, which limits independent learning and reduces motivation. Addressing this challenge requires a pedagogical shift toward the adoption of assistive technologies that can bridge the accessibility gap and promote autonomy among learners with special needs. Globally, the integration of Information and Communication Technology (ICT) has transformed teaching and learning. Tools such as screen readers, text-to-speech converters, and Audiobooks now play a critical role in facilitating inclusive education. Audiobooks, in particular, convert text-based materials into spoken words, enabling visually impaired learners to access educational content without relying on visual input (Beck, 2019). Audiobook provide flexibility, portability, and cost-effectiveness, allowing learners to engage with academic materials at their own

pace and environment. In addition, the auditory features of audiobooks tone, rhythm, and narration enhances academic achievement, retention, and emotional connection to learning materials.

Statement of the Research Problem

Despite the provisions of the Nigerian National Policy on Education (2006) and the global commitment to Inclusive Education, visually impaired students in Nigeria, particularly in Minna Metropolis, Niger State, continue to face profound and systematic barriers to effective learning. Learners are often deprived of equitable access to the standard curriculum, especially in technically demanding subjects like Computer Studies, which rely heavily on visual aids, diagrams, and on-screen demonstrations. The prevailing reliance on conversional, non-inclusive methods such as teacher dictation, limited Braille resources, and peer assistance (Perez & Roberts, 2018) fails to address their unique pedagogical needs, leading to passive learning, diminished comprehension, low retention rates, and consequently, poor academic performance (Lynch, 2019). While assistive technologies like audiobooks have been recognized globally for their potential in bridging accessibility gaps (Mulloy *et al*, 2014), the adoption and systematic study within the Nigerian educational context remain critically low (Ajuwon & Oyinlade, 2016). There is a significant disconnect between policy rhetoric on inclusion and classroom reality, characterized by a severe shortage of empirical, localized evidence on the impact of such tools. Existing studies on audiobooks have largely focused on Western contexts or on subjects like language arts and general literacy (Baskin & Harris, 2018; Moore & Cahill, 2016), leaving a substantial gap in evidence regarding effect on the learning outcomes of visually impaired students in practical, concept-driven STEM subjects like Computer Studies within Nigerian secondary schools (Ezekiel & Olubunmi, 2021).

Consequently, this study is necessitated by a clear imperative: to empirically investigate the effect of audiobook applications on visually impaired students in Nigeria. Specifically, it aims to determine the impact of such technology on critical learning outcomes: academic achievement, retention, and engagement within the context of Junior Secondary School Computer Studies. By generating this context-specific evidence, the research seeks to provide practical, evidence-based insights to inform pedagogical strategies, guide sustainable policy on assistive technology integration, and ultimately delineate a scalable pathway toward genuine educational inclusion and equity for visually impaired learners.

Purpose of the Study

The aim of this study is to investigate the effect of audiobook applications on visually impaired students: practical insights for Nigeria. The objectives of the study are to:

1. Identify the learning challenges that justify the need of an Audiobook application for enhancing the learning outcomes among visually impaired Computer Studies students in Junior Secondary Schools in Minna Metropolis Niger state, Nigeria.
2. Examine the effect of using an Audiobook application on the academic achievement of visually impaired Computer Studies students in Junior Secondary Schools in Minna Metropolis Niger state, Nigeria.

Research Questions

The following research questions were raised to guide the study:

1. What learning challenges do visually impaired students face in Computer Studies that justify the use of audiobook application to enhance learning outcomes among visually impaired Computer Studies students in Junior Secondary Schools in Minna Metropolis Niger state Nigeria?
2. Is there a significant difference in the mean academic achievement scores of visually impaired Computer Studies students taught using the audiobook application the learners taught using conventional teaching methods in Junior Secondary Schools in Minna Metropolis?

Hypotheses

The following null hypotheses were formulated and tested at a 0.05 level of significance:

H_{O1}: There is no significant difference in the mean academic achievement scores of visually impaired Computer Studies students taught using the Audiobook application and those taught using conventional methods in Junior Secondary Schools in Minna Metropolis.

Methodology

This study adopted a sequential explanatory mixed-methods research design (Creswell & Plano Clark, 2018), which systematically integrates qualitative and quantitative approaches to yield a more comprehensive and contextually nuanced understanding of the research problem. The design was deliberately selected because it begins with an initial qualitative phase aimed at exploring the specific learning challenges, contextual barriers, and lived experiences of visually impaired students in Minna Metropolis. This foundational phase ensured that the research was deeply informed by the voices and realities of the participants, thereby grounding the study in the actual educational context. Subsequently, the primary quantitative phase was conducted to empirically measure the effect of the audiobook application intervention on academic achievement. This two-phase structure allowed the qualitative findings to directly inform and contextualize the quantitative investigation, ensuring that the intervention was both relevant and responsive to the learners' identified needs. The study was conducted within Minna Metropolis, Niger State, Nigeria. Participants were drawn from Junior Secondary School in Special Education School Western bypass in Minna that offer Computer Studies as part of the national curriculum and enroll visually impaired students. This location was selected due to its representation of typical urban educational challenges and opportunities regarding inclusive education support in Northern Nigeria. The target population comprised all visually impaired students (both partially sighted and completely blind) enrolled in Junior Secondary Schools (JSS 1–3) in Special Education School Western bypass in Minna Metropolis. A purposive sampling technique was employed to select participants who met the criteria of being visually impaired and registered for Computer Studies. A total of 34 students participated and were non-randomly assigned to an experimental group (n=20) and a control group (n=14) to accommodate the limited and specialized population. The experimental group received instruction supplemented with an audiobook application, while the control group was taught using conventional methods (teacher dictation and limited braille).

Data were collected using two instruments:

1. Semi-structured Interview Guide (Qualitative Phase): This guide was used to conduct interviews with visually impaired students, their Computer Studies teachers, and special education experts. It contained open-ended questions designed to explore the specific learning challenges in Computer Studies and the perceived usefulness of audiobook technology.

2. Computer Studies Achievement Test (CSAT) (Quantitative Phase): A 40-item multiple-choice objective test was developed based on the JSS2 Computer Studies curriculum topics covered during the intervention. The CSAT was administered as both a pre-test and a post-test to measure academic achievement.

To ensure content validity, the research instruments were subjected to expert review. The interview guide and the CSAT were evaluated by three specialists in Special Education, Educational Technology, and Computer Studies. Their feedback was incorporated to improve clarity, relevance, and appropriateness for the target learners. A pilot study was conducted with 10 visually impaired students from a school not included in the main study to establish reliability. The internal consistency of the CSAT was determined using the Cronbach's Alpha formula, which yielded a coefficient of 0.78, indicating a good level of reliability for the test instrument. Data analysis followed the sequential mixed-method design; Qualitative Data: Interview transcripts were analyzed using thematic analysis as described by Braun and Clarke (2023). This involved familiarization with the

data, generating initial codes, searching for themes, reviewing themes, and defining and naming themes to present a structured account of the learners' challenges and needs. Quantitative Data: Data from the CSAT were analyzed using descriptive statistics (mean and standard deviation) to summarize the pre-test and post-test scores. An independent samples t-test was conducted at a 0.05 significance level using SPSS version 23 to test the hypothesis and determine if a significant difference existed between the academic achievement scores of the experimental and control groups.

Results

Qualitative Findings: Needs assessment and development of the audiobook application

This section presents the findings from the qualitative research approach of the study. Data were collected through semi-structured interviews with visually impaired Computer Studies students, Computer Studies teachers, and special education experts. The qualitative approach was employed to gain in-depth insights into the challenges faced by visually impaired students in learning Computer Studies and to explore the requirements for an audiobook application. Thematic analysis, as described by Braun and Clarke (2023), was used to identify recurring patterns in participants' responses. Codes were generated from the interview transcripts. These codes were then grouped into categories and overarching themes to provide a clear understanding of the needs and design of the audiobook application.

Thematic analysis revealed three major themes regarding the needs for developing the Audiobook application. Students consistently reported difficulties in accessing visual content such as diagrams, screenshots, and practical demonstrations, highlighting the need for content to be delivered entirely in an auditory format.

Teachers and experts confirmed that visually impaired students struggled to follow classroom instructions independently due to limited alternative resources. Participants also emphasised the need for interactive features such as pause, rewind, and replay functions, as well as self-assessment prompts to support comprehension. Structured content organisation, including chapters and subtopics, was identified as crucial to reduce cognitive overload. Finally, participants highlighted the importance of clear and simple language, high-quality narration, and integration with existing lesson plans to enhance engagement, understanding, and retention.

Table 1: Thematic Analysis of Interview Responses

Codes	Categories	Themes
Difficulty accessing diagrams and visual content	Accessibility challenges	Need for accessible learning resources
Reliance on teacher guidance	Learning independence	Need for independent learning tools
Difficulty understanding complex concepts	Cognitive support	Need for clear and descriptive content

From Table 1, presents the thematic analysis derived from the qualitative interview data obtained from visually impaired students, teachers, and special education experts. The analysis revealed seven major themes related to the learning needs and design considerations for developing the Audiobook application. The first theme, need for accessible learning resources, emerged from the repeated mention of difficulties in accessing diagrams and other visual content, indicating that traditional Computer Studies materials are not inclusive for visually impaired learners. The second theme, need for independent learning tools, reflects students' reliance on teacher guidance, suggesting that existing learning environments do not foster self-directed learning. The third theme, need for clear and descriptive content, captures the cognitive challenges students face in understanding complex concepts without adequate verbal explanations. Collectively, these themes provide a comprehensive understanding of the educational, cognitive, and technological requirements that guided the investigation of the audiobook application using the ISMAN model.

Table 2: Mean and Standard Deviation of Academic Achievement Scores of Visually Impaired Computer Studies Students Taught Using Audiobook Application and Those Taught Using Conventional teaching Method

Groups	N	Pre-test		Post-test		Mean Gain	Mean Difference
		$\bar{x}$	SD	$\bar{x}$	Std.		
Experimental	20	21.25	5.72	34.70	3.33	13.45	11.17
Control	14	19.43	5.76	21.71	4.25	2.29	

Table 2 shows that students in the experimental group, who used the audiobook application, achieved a mean gain of 13.45 points from pre-test to post-test. In contrast, the control group, taught via conventional methods, showed a minimal gain of 2.29 points. The difference in post-test performance between the groups was 11.17 points. This substantial divergence in learning gains over the intervention period indicates that the audiobook application had a strong positive effect on learning beyond what was achieved through standard teaching practices alone.

Table 3: Independent Samples t-test on Academic Achievement Scores of Computer Studies Students Taught with Audiobook and Those Taught with Conventional Method

Groups	N	Mean	Std. Deviation	df	t-value	p-value
Experimental	20	34.70	3.33	32	-9.99	0.00*
Control	14	21.71	4.25			

Significant at 0.05 ($p < 0.05$)

Table 3 shows the t-test on academic achievement mean scores of students taught using the Audiobook application and conventional teaching methods. The result revealed that students taught using the Audiobook application had a post-test mean score of 34.70 with a standard deviation of 3.33, while those taught using conventional methods had a post-test mean score of 21.71 with a standard deviation of 4.25. From the table, $t = -9.99$, $p = 0.00$. Since the p-value is less than the level of significance, hypothesis one was rejected, meaning that there is a significant difference in the academic achievement mean scores of visually impaired Computer Studies students taught using the Audiobook application and those taught using conventional teaching methods in Minna Metropolis. This implies a significant positive effect of the Audiobook application on academic achievement.

Summary of Findings

From the data analysed, the following are the summary of findings:

i. The **use** of the audiobook application significantly **enhanced** the learning outcomes of visually impaired Computer Studies students.
ii. There is a significant difference in the academic achievement scores of students taught using the Audiobook application and those taught using conventional teaching methods.

Discussion of Findings

This study investigated the effect of an audiobook application on the academic achievement of visually impaired students in Computer Studies in Nigeria. The discussion interprets the key findings in light of the research questions and situates them within the broader scholarly conversation on assistive technology and inclusive education.

The quantitative results revealed a statistically significant difference ($t(32) = -9.99$, $p < 0.05$) in post-test scores, with the experimental group achieving a substantially higher mean gain (13.45) than the control group (2.29). This finding strongly supports the efficacy of the audiobook application as an instructional tool. It aligns with the theoretical premise of the Cognitive Theory of Multimedia

Learning (Mayer, 2009), which posits that learning is enhanced when information is presented through the auditory channel, thereby reducing extraneous cognitive load for learners who cannot process visual inputs. In this case, the audiobook converted complex, visually-dependent Computer Studies concepts into coherent auditory explanations, facilitating better understanding. This result corroborates the work of Beck (2019), who found that audio-based materials significantly improved comprehension for students with print disabilities by leveraging their auditory processing strengths. The substantial gain observed in this study, as opposed to the marginal improvement under conventional methods, underscores the limitations of teacher dictation and highlights the need for structured, pedagogically sound auditory resources in the Nigerian context.

The thematic analysis from the qualitative phase identified core challenges: inaccessibility of visual materials, over-reliance on teacher guidance, and the need for independent, interactive learning tools. The significant quantitative outcome demonstrates that the developed audiobook application directly mitigated these barriers. By providing a self-paced, navigable audio resource with features like pause and rewind, the tool fostered the **independent learning** that participants craved, reducing their dependence on teacher dictation. This finding resonates with studies by Moore and Cahill (2016) and Perez and Roberts (2018), which argue that assistive technologies empower learners with visual impairments by granting them control over the pace and repetition of instruction, thereby increasing engagement and autonomy. The success of the application validates the participants' expressed needs and confirms that technology interventions are most effective when they are derived from and responsive to the specific contextual challenges faced by learners (Ajuwon & Oyinlade, 2016).

A key contribution of this study is its focus on a STEM subject (Computer Studies) within the Nigerian educational setting. While previous research has often highlighted audiobooks in language arts (Baskin & Harris, 2018), this study provides empirical evidence that the benefits extend to concept-heavy, technical subjects. The positive effect on achievement suggests that well-designed auditory explanations can successfully convey abstract and procedural knowledge, such as programming logic and system operations, which are traditionally taught visually. This addresses the gap noted by Ezekiel and Olubunmi (2021) regarding the lack of localized evidence for assistive technology in Nigerian STEM education. The findings therefore offer practical, evidence-based insights for policymakers and curriculum planners, advocating for the targeted integration of similar audio-based technologies into STEM curricula to promote genuine inclusion. In summary, the findings collectively indicate that the audiobook application was not merely an alternative format but a transformative pedagogical tool that enhanced learning by aligning instructional delivery with the cognitive and access needs of visually impaired students. The study bridges the gap between identified local challenges and a practical, evidence-based solution, reinforcing the call for the systemic adoption of affordable and contextually relevant assistive technologies to achieve equitable quality education in Nigeria, as envisioned in the National Policy on Education (2006) and UNESCO's (2017) framework for inclusion.

Conclusion

This study set out to investigate the effect of audiobook applications on visually impaired students in Nigeria, with a specific focus on academic achievement in Computer Studies. The findings provide robust and practical insights that affirm the significant role of tailored assistive technology in fostering inclusive education. The research conclusively demonstrates that the use of a curriculum-aligned audiobook application significantly enhances the academic achievement of visually impaired Junior Secondary School students. The statistically substantial mean gain observed in the experimental group, compared to the marginal improvement under conventional teaching methods, confirms that audio-based instructional delivery effectively addresses the pedagogical and accessibility gaps faced by these learners. By converting visually dependent content into structured auditory explanations, the application reduced cognitive overload, promoted independent and self-paced learning, and improved comprehension of abstract Computer Studies concepts.

Furthermore, the study underscores the importance of grounding educational technology interventions in the lived experiences and expressed needs of the target learners, as revealed through the initial qualitative inquiry. The positive outcomes validate that assistive tools are most effective when they are context-specific, interactive, and aligned with both the national curriculum and the learners' auditory strengths. In light of these findings, it is evident that audiobook applications are not merely supplementary aids but essential pedagogical tools for achieving equitable learning outcomes in STEM education for visually impaired students in Nigeria. Therefore, this study contributes practical, evidence-based justification for the systematic integration of such affordable and scalable assistive technologies into teacher training, classroom practice, and educational policy, paving the way toward genuine and sustainable inclusion.

Recommendations

Based on the significant positive effects of the audiobook application demonstrated in this study, the following actionable recommendations are proposed to facilitate the integration of audio-based assistive technologies into the Nigerian educational system:

- School administrators, in collaboration with Special Education Units, should allocate a dedicated budget within their annual ICT expenditure for the procurement of audiobook applications and compatible hardware (e.g., tablets, MP3 players). A pilot implementation should begin in at least one Junior Secondary School per state, focusing initially on STEM subjects. Schools should also establish a lending system for these devices to ensure all visually impaired students have equitable access both in school and at home.
- The National Teachers' Institute (NTI) and State Universal Basic Education Boards (SUBEBs) should mandate and fund periodic in-service training workshops. These workshops, co-facilitated by special education experts and educational technologists, should equip Computer Studies and other subject teachers with the skills to: a) utilize audiobook applications effectively in lesson delivery, b) adapt existing lesson plans to incorporate audio resources, and c) provide basic technical support to students. Completion of such training could be linked to professional development credits.
- The Federal and State Ministries of Education should establish a Digital Accessibility for Inclusive Learning (DAIL) grant. This fund would support: a) the development and localization of open-access audiobook libraries aligned with the national curriculum, b) research into other low-cost assistive technologies, and c) awareness campaigns to promote inclusive education practices. Policy should be amended to include specific guidelines on the provision of accessible digital learning materials as a standard requirement in all public schools.
- Tertiary institutions, particularly Faculties of Education and Educational Technology departments, should prioritize and fund research grants for postgraduate students and faculty to replicate this study in other STEM subjects (e.g., Mathematics, Basic Technology) and socio-scientific subjects. Furthermore, longitudinal research partnerships between universities and State Education Boards should be formed to track the long-term impact of audiobook use on student retention, transition rates to senior secondary school, and overall academic self-concept.

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