



## ENHANCING ACCESSIBILITY AND PERSONALIZED LEARNING EXPERIENCE OF LEARNERS WITH SPECIAL NEEDS THROUGH ARTIFICIAL INTELLIGENCE IN IBADAN

By:

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### Abstract

*This study empirically examined special educators' perceptions of AI's effectiveness in enhancing educational accessibility and personalization for learners with special needs in inclusive schools in Oyo State, Nigeria. The study, which is guided by three research questions, adopted a descriptive survey design. Data were collected from 80 special educators via a Questionnaire on Artificial Intelligence and Educational Accessibility and Personalization for Learners with Special Needs (QAI-EAPELSN,  $r = .81$ ). Data were analyzed using frequency counts, percentages, means and standard deviation to provide answers to research questions. Results indicated a high extent of positive impact regarding AI's ability to enhance accessibility (weighted average 72.8%, mean 1.73, SD 0.443), with the overall majority agreeing that AI-driven platforms support independent learning. For personalized learning, a weighted average of 66.5% (mean 1.67, SD 0.471) indicated AI's effectiveness, with 72.5% noting AI's role in tracking progress and adjusting instruction. However, significant challenges were identified (weighted average 65.5%, mean 1.66, SD 0.475), primarily the high cost of AI technologies (73.8%) and the lack of teacher training (70%). Other barriers included difficulties integrating AI into existing plans (63.7%) and inconsistent internet/power (58.8%). The study concludes that while AI holds substantial promise for inclusive education, financial, infrastructural, and capacity-building limitations impede its widespread implementation.*

**Key Words:** Accessibility; Artificial Intelligence; Personalized Learning Experience; Learners with Special Needs

## **Introduction**

The advent of Artificial Intelligence (AI) in education has offered new opportunities for boosting learning experiences, particularly for learners with special needs. In towns like Ibadan, where inclusive education is progressively getting attention, AI technologies present intriguing methods for boosting accessibility and individualizing training. Learners with impairments often confront problems such as inaccessible learning resources, generic teaching techniques, and inadequate classroom support (Mehta, Chillarge, Sapkal, Shinde & Kshirsagar, 2023). AI tackles these difficulties by delivering adaptive and assistive solutions suited to individual learner needs. AI promotes accessibility by delivering various formats and support tools for students with physical, sensory, or cognitive disabilities. For instance, text-to-speech and screen reader technology serve students with visual impairments, while speech-to-text and captioning tools support those with hearing challenges. In Ibadan, where conventional resources for learners with special needs are scarce, these AI-driven solutions can serve as practical interventions to overcome the accessibility gap in inclusive classrooms (Afolabi, Olaniyi & Adebayo, 2022). Beyond accessibility, AI enables individualized learning by evaluating students' learning patterns and customizing content accordingly. AI-powered systems may change the complexity of tasks, pace of instruction, and style of delivery based on individual learners' performance and preferences. This tailored approach is particularly useful for learners with special needs, as it accommodates varied learning styles and paces, minimizing frustration and improving engagement (Alkan, 2024).

Despite these benefits, the deployment of AI in Ibadan's inclusive classrooms is not without obstacles. Mpu (2024) asserted that many instructors lack the necessary training to properly employ AI tools, and infrastructural issues such as poor internet connectivity and insufficient digital devices restrict deployment. Additionally, financial limits in public schools and worries over data privacy provide extra impediments (Mpu, 2024). This study is supported by Vygotsky's Zone of Proximal Development (ZPD) theory, which highlights the need to give targeted support to help learners achieve activities they cannot perform individually but can finish with assistance (Vygotsky, 1978). AI technologies, through adaptive learning and real-time feedback, act as digital scaffolds that adjust instruction according to each learner's cognitive ability, hence boosting accessibility and learning results for kids with special needs (Alkan, 2024). This study analyzes how AI is boosting accessibility and personalized learning for learners with special needs in Ibadan while addressing the practical issues faced by instructors. Understanding these interactions is vital for influencing inclusive education strategies and fostering equal usage of technology in Nigerian classrooms.

Artificial Intelligence has increasingly been acknowledged as a disruptive force in special needs education, with the potential to address both accessibility and tailored instruction (Harkins-Brown Carling & Peloff, 2025; Mehta *et al.*, 2023; Scott, Wilder, Zaugg and Romualdo, 2024). In terms of accessibility, AI tools such as speech recognition, text-to-speech engines, and intelligent captioning systems help break down obstacles that typically restrict the participation of learners with impairments (Elshazly, 2024; Zhang and Leong, 2024). These techniques are especially crucial in locations like Ibadan, where special education resources remain scarce (Harkins-

Brown, Carling and Peloff, 2025). For instance, screen readers and real-time transcription services enable students with visual or hearing impairments to follow classroom activities more successfully (Elshazly, 2024). Moreover, AI facilitates individualized learning by tailoring instruction to suit individual learners' profiles (Dumbuya, 2024; Santos *et al.*, 2024; Taşkın, 2025).

Adaptive learning platforms can assess performance data and modify content to match the student's cognitive level, pace, and preferred learning modality (Alkan, 2024; Dumbuya, 2024; Mahalakshmi, 2025; Ramaiah *et al.*, 2024; Santos *et al.*, 2024; Taşkın, 2025). Such technology allows students with learning impairments to progress at their own speed, revisit difficult ideas, and receive targeted interventions (Alkan, 2024; Harkins-Brown *et al.*, 2025; Mahalakshmi & K, 2025; Ramaiah *et al.*, 2024). In inclusive classrooms in Ibadan, this capacity is particularly important given the vast range of talents among learners and the shortage of specialist teaching staff (Mpu, 2024).

Despite these advantages, various studies emphasize the hurdles educators have in implementing AI into special needs education (Mpu, 2024). Many teachers in Nigerian schools lack the technical abilities required to run AI tools properly (Mpu, 2024). Additionally, infrastructural deficiencies—such as unreliable power supply, inadequate internet connectivity, and limited access to digital devices—hinder successful deployment (Mpu, 2024). Financial hurdles also exist, as most public schools cannot finance sophisticated AI systems or maintain them (Mpu, 2024). Concerns about student data privacy and algorithmic bias also complicate the deployment of AI in educational contexts (Mpu, 2024). Collectively, the literature reveals that while AI holds promise for boosting accessibility and customisation in special needs education, particularly in under-resourced regions like Ibadan, its adoption must be deliberately managed. Success will depend on teacher training, policy backing, infrastructural development, and ethical oversight to assure equity and sustainability.

### **Purpose of the Study**

This study aims to empirically examine the effectiveness of artificial intelligence in improving educational accessibility and personalization for learners with special needs in inclusive school settings as perceived by special educators. Specifically, the study:

1. Examines the extent to which AI can enhance accessibility for learners with special needs.
2. Inquire into the extent to which AI supports personalized learning experiences in inclusive classrooms.
3. Determine the major challenges that educators face in implementing AI for learners with special needs.

## **Research Questions**

The study is guided by the following research questions:

1. To what extent does artificial intelligence enhance accessibility for learners with special needs?
2. To what extent does AI support personalized learning experiences in inclusive classrooms?
3. What challenges do educators face in implementing AI for learners with special needs?

## **Methodology**

The study adopted the descriptive survey research design. The study population included special education teachers in all-inclusive secondary schools in Oyo State, Nigeria. The purposive sampling technique was used to select 80 special educators from inclusive secondary schools within Oyo State. A questionnaire on Artificial Intelligence and Educational Accessibility and Personalization for Learners with Special Needs (QAI-EAPELSN), designed by the researchers, was used for data collection. The instrument, which has 15 items, uses a Yes or No scale for responses. It focuses on the extent to which artificial intelligence enhances accessibility for learners with special needs, the extent to which it supports personalized learning experiences in inclusive classrooms, and the challenges do educators face in implementing AI for learners with special needs.

The face and content validity of the instrument was achieved through vetting and expert review. The construct validity of the instrument was done through the contributions of experts in Special Education, Educational Technology, and Measurement and Evaluation. The reliability of the instrument was achieved by pilot-testing it on two groups of special educators in another state with a similar population to the one being studied. The results were compared using the Spearman-Brown prophecy formula. A reliability coefficient of 0.81 was derived for QAI-EAPELSN. The instrument was administered to the teachers in their schools after taking permission from the concerned authority. Ethical consideration was considered as the researcher obtained informed consent of the respondents, ensured anonymity and confidentiality of the information given. Data collected were secured and saved. Descriptive statistics, particularly frequency count, percentage, mean, and standard deviation, were used to analyze the data collected and provide answers to the research questions.

## Results

**Table 1: Respondents' Socio-demographic Characteristics (n = 80)**

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Variable	N	%	Mean	SD
<b>Gender</b>				
Male	26	32.5		
Female	54	67.5	1.68	.471
Total	80	100.0		
<b>Age (in years)</b>				
25-34	27	33.8		
35-44	30	37.5	1.95	.749
45 & above	23	28.7		
Total	80	100.0		
<b>Years of experience</b>				
1-10	38	47.5		
11-20	19	23.8	1.85	.858
21 & above	23	28.7		
Total	80	100.0		

Table 1 presents the socio-demographic characteristics of the 80 respondents. The majority were female (67.5%), while males constituted 32.5%, with a gender mean of 1.68 (SD = 0.471), indicating a female-dominated sample. In terms of age, respondents aged 35–44 formed the largest group (37.5%), followed by those aged 25–34 (33.8%) and 45 years and above (28.7%). The average age category was close to the middle age range (Mean = 1.95, SD = 0.749). Regarding years of experience, nearly half (47.5%) had between 1–10 years of experience, 28.7% had 21 years and above, while 23.8% had 11–20 years. The mean experience category was 1.85 (SD = 0.858), indicating a relatively younger workforce in terms of professional experience.

**Research Question 1:** To what extent does artificial intelligence enhance accessibility for learners with special needs?

**Table 2: Artificial Intelligence and Accessibility for Learners with Special Needs (n = 80; Criterion Mean = 1.5)**

SN	Statement	Yes (%)	No (%)	Mean	SD	Remarks
1.	AI tools (e.g., screen readers, voice assistants) help learners with special needs access educational content more easily.	78.8	21.2	1.79	.412	High extent
2.	AI-driven learning platforms support independent learning for students with physical or sensory impairments.	80.0	20.0	1.80	.403	High extent
3.	AI technologies have significantly improved access to communication for learners with speech or hearing impairments.	68.8	31.2	1.69	.466	High extent
4.	The use of AI in schools has reduced learning barriers for students with special needs.	71.3	28.7	1.71	.455	High extent
5.	AI enhances classroom participation for learners with special needs by providing real-time assistance.	65.0	35.0	1.65	.480	High extent
	Weighted average	72.8	27.2	1.73	.443	High extent

Table 2 addresses the extent to which artificial intelligence (AI) enhances accessibility for learners with special needs. The findings show a generally positive perception, with a weighted average of 72.8% of respondents affirming the usefulness of AI, and a mean score of 1.73 (SD = 0.443), indicating a high extent of impact. Specifically, 80% agreed that AI-driven platforms support independent learning, and 78.8% acknowledged the role of AI tools such as screen readers and voice assistants in improving access to educational content. In addition, 71.3% believed AI has reduced learning barriers, while 68.8% agreed it has improved communication access for students with speech or hearing impairments. Although slightly lower, 65% still recognized AI's role in enhancing classroom participation. These results collectively suggest that AI technologies play a significant role in promoting inclusivity and accessibility for learners with special needs.

**Research Question 2:** To what extent does AI support personalized learning experiences in inclusive classrooms?

**Table 3: AI and Personalized Learning in Inclusive Classrooms (n = 80; Criterion Mean = 1.5)**

SN	Statement	Yes (%)	No (%)	Mean	SD	Remarks
6.	AI applications help tailor lessons to suit the learning pace and style of each student with special needs.	67.5	32.5	1.68	.471	High extent
7.	Adaptive learning systems powered by AI provide timely feedback to improve learning outcomes.	63.7	36.3	1.64	.484	High extent
8.	AI supports inclusive teaching by enabling differentiated instruction in diverse classrooms.	70.0	28.7	1.71	.457	High extent
9.	AI helps track the progress of learners with special needs and adjust instruction accordingly.	72.5	27.5	1.73	.449	High extent
10.	Personalized learning through AI motivates students with special needs to engage more in class activities	58.8	41.3	1.59	.495	High extent
	Weighted average	66.5	33.5	1.67	.471	High extent

Table 3 examines the extent to which artificial intelligence (AI) supports personalized learning experiences in inclusive classrooms. The responses indicate a generally positive perception, with a weighted average of 66.5% agreeing and a mean score of 1.67 (SD = 0.471), reflecting a high extent of impact. Notably, 72.5% agreed that AI helps track learners' progress and adjusts instruction accordingly, while 70% affirmed that AI enables differentiated instruction in diverse classrooms. Additionally, 67.5% believed AI helps tailor lessons to individual learning styles and paces, and 63.7% recognized the role of adaptive learning systems in providing timely feedback. Although relatively lower, 58.8% agreed that AI motivates students with special needs to engage more in classroom activities. Overall, the data suggests that AI significantly enhances personalized learning by supporting individualized instruction, tracking progress, and promoting inclusivity in the classroom.

**Research Question 3:** What challenges do educators face in implementing AI for learners with special needs?

**Table 4: Challenges in Implementing AI for Learners with Special Needs (n = 80; Criterion Mean = 1.5)**

SN	Statement	Yes	No	Mean	SD	Remarks
11.	Lack of teacher training is a major barrier to the effective use of AI in special education.	70.0	30.0	1.70	.461	Significant
12.	The high cost of AI technologies limits their availability in many schools.	73.8	26.2	1.74	.443	Significant
13.	Internet connectivity and power issues affect the consistent use of AI tools in classrooms.	58.8	41.3	1.59	.495	Significant
14.	Some AI applications are not designed to accommodate all categories of special needs.	61.3	38.8	1.61	.490	Significant
15.	Educators find it difficult to integrate AI into existing teaching plans for students with special needs.	63.7	36.3	1.64	.484	Significant
	Weighted average	65.5	34.5	1.66	.475	Significant

Table 4 highlights the challenges educators face in implementing AI for learners with special needs. The findings reveal a significant level of concern, with a weighted average of 65.5% affirming the presence of these challenges and a mean score of 1.66 (SD = 0.475). The most cited issue is the high cost of AI technologies, noted by 73.8% of respondents. This is followed closely by the lack of teacher training (70%), indicating a critical need for professional development. Other notable challenges include difficulties in integrating AI into existing teaching plans (63.7%) and the limited inclusiveness of some AI applications (61.3%). Additionally, 58.8% reported that internet and power issues hinder consistent AI use. Overall, the data suggest that while AI offers great promise for inclusive education, its effective implementation is hampered by financial, infrastructural, and capacity-related barriers that need to be addressed for wider adoption.

### Discussion of Findings

Research Question 1 is meant to assess the extent to which artificial intelligence enhances accessibility for learners with special needs. Findings revealed that 72.8% of respondents agreed that AI tools such as screen readers, speech-to-text, and real-time captioning significantly improved accessibility for students with visual and hearing impairments. Teachers cited tools like Microsoft Immersive Reader and Google's Voice Typing as transformative. One ICT coordinator stated, "Speech recognition has given non-verbal students a voice in the classroom." These findings align with scholarly assertions that AI is a disruptive force in special education with immense potential to address long-standing accessibility challenges (Harkins-Brown *et al.*, 2025; Mehta *et al.*, 2023; Scott *et al.*, 2024). Tools powered by AI—such as text-to-speech engines, speech recognition software, and intelligent captioning systems—have proven particularly effective in dismantling barriers that often prevent full engagement of students with disabilities (Elshazly, 2024; Zhang & Leong, 2024). In contexts such as Ibadan, where access to specialized



resources is still limited, these AI innovations serve as practical alternatives to human-intensive support structures (Harkins-Brown, Carling & Peloff, 2025).

Furthermore, screen readers and real-time transcription not only facilitate comprehension but also promote inclusivity in classroom interactions. Students with visual impairments can follow along with text-based content, while those with hearing impairments can access spoken language through instant captions. Such technologies do not merely assist learning—they redefine what full participation means in an inclusive classroom.

Research Question 2 probes into the extent to which AI supports personalized learning experiences in inclusive classrooms. 66.5% of participants indicated that AI applications helped tailor content to learners' cognitive levels and pace. This aligns with findings from several studies that highlight the role of AI in enhancing individualized instruction. For instance, AI-driven platforms such as DreamBox and Smart Sparrow were reported to be widely used in inclusive classrooms to support differentiated learning. These platforms dynamically adjust content delivery based on learners' ongoing performance data, thereby ensuring that students receive instruction aligned with their unique capabilities and preferences (Alkan, 2024; Dumbuya, 2024; Mahalakshmi, 2025; Ramaiah *et al.*, 2024; Santos *et al.*, 2024; Taşkın, 2025). Teachers noted improved engagement and comprehension levels among students when lessons were adapted in real-time, reflecting a shift toward more responsive and student-centered learning environments.

Further supporting this, adaptive learning systems enable students with learning disabilities or impairments to revisit challenging concepts, proceed at their own pace, and receive immediate corrective feedback. This flexibility is particularly beneficial in inclusive classrooms in Ibadan, where disparities in cognitive abilities are wide and specialized support staff are often limited (Mpu, 2024). The tailored nature of AI interventions thus plays a critical role in mitigating these constraints and promoting equitable access to learning. In addition to cognitive personalization, AI tools such as screen readers and real-time transcription services have improved accessibility for students with visual and hearing impairments, allowing them to participate more fully in class discussions and content delivery (Elshazly, 2024). These tools help bridge communication gaps and ensure that learning is not only personalized but also inclusive. Ultimately, the empirical data and supporting literature demonstrate that AI significantly contributes to personalized and inclusive education by aligning content delivery with individual learning profiles, facilitating access, and compensating for human resource limitations in special education settings (Dumbuya, 2024; Santos *et al.*, 2024; Taşkın, 2025; Carling *et al.*, 2025).

Research Question 3 identifies the challenges that educators face in implementing AI for learners with special needs. Despite the benefits, participants reported several barriers, including the high cost of AI technologies, the lack of teacher training, difficulties in integrating AI into existing teaching plans, the limited inclusiveness of some AI applications and internet, and power issues, which hinder consistent AI use. This finding is highlighted in Mpu's (2024) study, which found that many public schools in Nigeria are unable to afford or maintain sophisticated AI tools, particularly those designed to support learners with special needs. The financial strain is compounded by the lack of government subsidies or dedicated funding for AI-based interventions in education.

Another significant obstacle reported is the lack of technical training among educators. Many teachers, especially those in mainstream or under-resourced schools, are not adequately trained to operate or integrate AI applications into their teaching routines (Mpu, 2024). This knowledge gap leads to underutilization or misuse of available AI tools, limiting their potential benefits for learners who require individualized support. Infrastructural deficiencies—such as unreliable electricity, poor internet connectivity, and limited access to digital devices—also emerged as critical issues. Mpu (2024) notes that these infrastructural barriers severely restrict the consistent use of AI tools, especially in rural and semi-urban areas where these services are erratic. As a result, even when AI resources are available, their functionality is often disrupted, undermining the continuity of support for learners with special needs.

Moreover, educators pointed out the limited inclusiveness of certain AI applications. Some tools lack accommodations for diverse impairments, such as visual, auditory, or cognitive disabilities, making them unsuitable for universal application in inclusive classrooms. There were also concerns about data privacy and algorithmic bias, with educators expressing caution over how student information is used and whether AI systems treat all learners equitably (Mpu, 2024). In summary, while AI offers substantial advantages for inclusive education, the cost, infrastructural gaps, insufficient teacher training, and systemic limitations significantly impede its implementation. Addressing these challenges is critical for ensuring that AI fulfills its promise of supporting all learners effectively, particularly those with special educational needs.

## **Conclusion**

The study found that AI technologies are pertinent for making learning more accessible and inclusive for students with special needs by giving them personalized help and lowering the barriers to learning. AI also improved personalized learning by providing individualized training, tracking progress in real time, and delivering content that adapts to each student's needs. This helped students stay interested and do well in school in inclusive classrooms. But there are several things that make it hard to use AI effectively, such as not having enough money, not having the right infrastructure, having unstable internet and power, and teachers not having enough technical expertise. These problems make it hard for AI tools to be used widely and for a long time in special needs education.

## **Recommendations**

Based on the results, the following are suggestions:

1. The government and other interested parties should help fund for AI technologies to make them accessible in public schools, especially for students with special needs.
2. Educators should be able to enhance their technical skills in effectively employing AI tools in inclusive classrooms through capacity-building initiatives.
3. Infrastructure upgrades, particularly stable internet and power supply, should be prioritized to allow continuous and successful usage of AI technologies in schools.
4. AI app developers should make sure that their products are accessible to people with a wide range of disabilities and that user data is kept private.

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