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TEACHERS' KNOWLEDGE AND USE OF ARTIFICIAL INTELLIGENCE IN DEAF EDUCATION IN AKWA IBOM STATE, NIGERIA

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Abstract
Artificial Intelligence (AI) is reshaping educational practice in ways that are especially consequential for deaf learners. Its ability to achieve desired results, however, depends on teachers' knowledge, attitudes, and material conditions. This qualitative descriptive study examined how teachers in Akwa Ibom State, Nigeria, understand and use AI in deaf education. Semi structured interviews were conducted with fifteen teachers working in special and inclusive schools. The results were analyzed using reflexive thematic analysis. Findings indicate a spectrum of awareness and emerging practice, broad belief in AI's value for communication access, participation, and learner independence, and interlocking infrastructural and pedagogical barriers, including unreliable electricity and internet, scarce devices and funding, limited training, and poor localization to Nigerian sign and classroom contexts. The paper proposes a practical roadmap for responsible AI integration that emphasizes state-supported professional development, infrastructural investment, clear school-level implementation routines, and codesign processes that localize tools for deaf learners. The study provides practice-based evidence to inform policy and guide responsible AI adoption in African deaf education.

Keywords: Artificial Intelligence, Deaf education, Teacher knowledge, Inclusive technology, Teacher perspectives

Introduction

Artificial intelligence is now woven into everyday tools that teachers and students already use, from automated captioning on mobile devices to classroom transcription and text generation. In education scholarship there is wide agreement that artificial intelligence can improve access, personalization, and feedback for learners when it is planned and supported well. At the same time researchers caution that desirable educational outcomes is not obtained from technology adoption alone, and that impact depends on context specific conditions that include policy, infrastructure, teacher readiness, and ethical guardrails (Julien, 2024).

In this study, teachers' partial and emergent knowledge of artificial intelligence mirrored broader patterns in literature. Most participants had heard of AI but were unsure how specific tools could be used meaningfully in deaf education, and only a small minority reported confident, routine use in teaching. Similar studies have shown that AI may be used to supply partial access to spoken content and can support note taking and after class review (Opesemowo, 2024; Zhang, 2025). Teachers' calls for dependable access, clear routines, and equitable support align with long-standing inclusive education frameworks that expect school systems to ensure dignified participation for diverse learners and to provide reliable, fairly distributed supports (CAST, 2018; Federal Ministry of Education, 2023).

Theoretical Anchors for Inclusion and Access

The paper is situated in practical concerns of access, participation, and independence for deaf learners, and treats artificial intelligence as a mediating layer within these existing inclusion commitments rather than as a neutral add-on. Conceptually, AI is understood as one element in a broader system of curricula, language policies, infrastructure, and classroom routines that can either expand or restrict inclusion, depending on how it is designed, governed, and enacted in context. AI can enhance participation and expression when it is deliberately paired with effective teaching (Julien,

2024; Mogoale et al., 2025). From this standpoint, "readiness" is not merely individual technical competence but a systems-level capacity that includes planning, collaboration, and ethical standards to ensure that AI contributes to the dignity and participation of diverse learners.

Problem Statement

Schools in Akwa Ibom State confront the same two-sided reality that appears in international literature. Artificial intelligence tools offer new ways to support access and participation for deaf learners in settings where human supports are often insufficient. At the same time artificial intelligence requires electricity, connectivity, devices, and skills. In many schools power outages, bandwidth constraints, and limited device pools make planned use difficult. Teachers often learn through trial and error without structured training or school level routines to support responsible use. Stakeholders in Nigeria have voiced concerns about policy clarity and about curriculum alignment and have called for support to build artificial intelligence literacy among teachers and students so that both groups can participate in decisions about adoption and classroom use (Sanusi et al., 2024). In this context the question is not whether artificial intelligence will appear in schools. It already has through phones and everyday applications. The question is whether teachers have enough knowledge and support to use artificial intelligence in ways that improve communication and learning for deaf students without widening inequities or creating new risks.

Purpose of the study

This paper investigates how teachers in Akwa Ibom State understand and use artificial intelligence in deaf education. The aim is to provide context specific evidence that can inform teacher learning, school routines, and policy. The paper focused on classroom realities and practical implications for access, participation, and learner independence. The goal is to describe current knowledge and practice, to surface perceived benefits and challenges, and to identify the infrastructural and professional support that teachers say they need.

Significance of the study

The study contributes to a small but growing Nigerian literature on artificial intelligence in school contexts and connects deaf education to broader conversations about inclusion and equity in technology adoption. It also offers timely insights for developers and decision makers who seek to localize tools for Nigerian classrooms.

Research questions

The following research questions guided the study:

1. What is the current level of awareness and knowledge of artificial intelligence tools among teachers of deaf students in Akwa Ibom State.
2. In what ways are these teachers currently using artificial intelligence in classrooms?

Review of Related Literature

This review synthesizes current peer-reviewed scholarship on Artificial Intelligence in Education (AIEd) and on inclusion for deaf learners, with a focus on teacher knowledge and classroom implementation in African contexts and related settings. The scope is defined by a critical need to understand how emerging technologies intersect with long-standing educational challenges in the Global South, particularly for marginalized student populations. The researchers draw on a range of empirical, review, and conceptual articles to provide an integrated narrative of the current state of the field.

Artificial Intelligence and Inclusive Education

Recent syntheses describe artificial intelligence as a powerful potential support for inclusion that can personalize learning, offer adaptive feedback, and strengthen participation for diverse learners (UNESCO, 2023; Julien 2024). The core promise of AIEd lies in its capacity to move beyond a one-size-fits-all model of instruction. For instance, adaptive learning systems can adjust the difficulty of

content in real-time based on student performance, providing targeted support for those who are struggling and advanced challenges for those who have mastered a concept (Baker & Smith, 2019). Julien (2024) notes that desirable educational outcomes do not occur by merely using AI computing technologies and calls for deliberate planning and evaluation to support genuine inclusion. Similarly, Mogoale et al., (2025) found that successful integration depends on a holistic ecosystem of planning, collaboration, training, and ethical standards that ensure responsible use for both learning and administration. The authors summarize their result as thus, planning, collaborations, training, and ethical standards, and argue for a tailored, context-aware approach for each institution so that artificial intelligence improves teaching while adhering to policy rules regarding data privacy and academic integrity (Mogoale et al., 2025). Together, these studies suggest that the promise and practice of AI for inclusion are out of step in many school systems. Artificial intelligence can support inclusion, but realizing this potential requires that teachers receive structured exposure, practice, and ongoing institutional support to move from occasional experimentation to routine, pedagogically sound classroom use (Uwonkunda & Beco, 2025).

Inclusion for Deaf Learners and the Role of Technology

Contemporary literature on deaf education in African contexts highlights communication access as the non-negotiable foundation for inclusion and recounts persistent gaps in classroom practice (Nyamwange, 2025). A narrative study in Zimbabwe links meaningful participation directly to sign-competent teaching and to material supports such as note-taking devices and hearing aids. They emphasize the urgent "need for competent teachers and adequate resources to sustain learning and well-being" (Mukuna & Maizere, 2022). This evidence reinforces the trend that any new technology introduced into such classrooms will be judged by its ability to improve daily access to instruction, enable meaningful participation in discussions and activities, and protect the dignity and linguistic identity of deaf learners (Polspoel et al., 2024). Within this practical lens, recent studies position AI tools as possible bridges for access where human supports, such as qualified sign language interpreters, are insufficient. Technologies like automatic speech-to-text (STT) captioning can provide real-time textual access to spoken lectures, though their effectiveness is often limited by audio quality, speaker accents, and specialized vocabulary (Combrink et al., 2023). More advanced frontiers include Automatic Sign Language Recognition (ASLR) and avatar-based translation, but these technologies remain in early stages and face immense technical hurdles, including the lack of large, annotated datasets for African sign languages (Kumar & Singh, 2024).

Teacher Knowledge, Attitudes, and Readiness

Teachers are the front-line arbiters of AI integration, and their knowledge, confidence, and ethical judgment strongly shape outcomes for inclusion (Mishra & Koehler, 2006). Across several recent studies, teacher awareness is variable and often limited in scope. In the Nigerian mathematics study, most teachers reported low familiarity with ChatGPT and few used it in daily instruction (Sanusi et al, 2024). When teachers did use the tool, they reported positive outcomes on engagement and comprehension but also cited challenges of technical adaptability, curriculum alignment, and the need for customization to diverse learning styles. The authors call for "continuous professional development and ongoing support" to integrate AI proficiently.

Teacher attitudes are also a critical factor. A qualitative study in South Africa explored teachers' emotional responses to the prospect of AI, identifying a mix of excitement and anxiety (Morgan et al., 2025). While some were eager to use AI to reduce administrative burdens and create more engaging lessons, others expressed fear of being replaced, concerns about the erosion of human connection in teaching, and worries about academic dishonesty. This highlights the need for implementation strategies that are collaborative and supportive, framing AI as a tool to augment, not replace, the teacher's professional judgment (Fullan & Quinn, 2023). Teacher readiness is also connected to institutional conditions. The systematic review on higher learning institutions in South Africa highlights the need for institutional planning with clear policy, collaboration across units, and sustained training opportunities (Mogoale et al., 2025). The review argues that institutions must ensure AI enhances teaching and administration while adhering to regulations that protect student privacy and data quality. The authors insist that policy and practice be developed in tandem so that teachers are not left to improvise without guidance or support. This institutional message has direct

relevance for basic education systems that seek to scale inclusive AI use across special and inclusive schools (Mogoale et al, 2025).

Synthesis and Gap Statement

Across the current peer-reviewed literature, there is a clear convergence on three points. First, artificial intelligence holds significant potential to support inclusion in ways that matter for deaf learners. Second, teacher knowledge, readiness, and confidence are uneven and often limited, leading to sporadic classroom use and a reliance on personal improvisation rather than planned, pedagogically-grounded routines. This "readiness gap" remains a primary obstacle to effective implementation. Third, infrastructure and policy conditions set the ceiling on what schools can achieve, since unreliable power, weak internet, limited devices, unclear data privacy regulations, and the lack of funding make sustained classroom use difficult, especially in the Global South. The literature also identifies a critical gap which this study addresses. There are very few empirical studies that examine localized, co-designed AI supports for sign language-rich classrooms and for multilingual deaf education in African contexts (Enwedo et al., 2025). Much of the existing technology is designed for English and American Sign Language. There is a need for co-designed tools that fit Nigerian curricula, accents, and sign language practices and for research that documents how such tools affect classroom access, student participation, and learning outcomes over time. The present study responds to this gap by reporting on teacher knowledge and use of AI in Akwa Ibom State, Nigeria, and by translating these findings into practical, context-specific recommendations for training, infrastructure investment, and localized tool design.

Methods

Design

A qualitative descriptive design was employed in this paper. This approach prioritizes low- inference description and clear links from data to practice recommendations.

Participants and setting

Fifteen teachers who work with deaf learners in Akwa Ibom State participated in the study. The sample included educators from special schools and from mainstream inclusive classrooms in public settings. The researchers used purposive recruitment to reach teachers who actively support deaf or hard of hearing learners during regular instruction. Inclusion criteria were current teaching responsibilities with at least one deaf learner and willingness to participate in an interview about artificial intelligence and classroom practice. Variation in teaching context and years of experience were sought so that the analysis would reflect a range of perspectives rather than a single school culture. Participants varied in years of experience, training background, and exposure to digital tools. Pseudonyms are used throughout to protect confidentiality. The setting is characterized by mixed resource conditions that are common in the region. Special schools offered more concentrated expertise in deaf education and stronger peer grouping for students. Inclusive classrooms offered opportunities for interaction with hearing peers but presented additional demands on teachers who must manage complex communication needs and competing curricular expectations. Across both settings teachers reported variable access to electricity and connectivity which shaped their willingness to plan lessons that rely on artificial intelligence. These contextual factors are not treated as findings. They are reported here to support transferability and to give readers a grounded sense of the conditions in which the study took place.

Instrumentation

Interviews followed a semi structured guide that was aligned with the four research questions and designed to elicit concrete accounts of practice. The guide included sections on role and classroom context, awareness and mental models of artificial intelligence, current practice, scenario vignettes, perceived benefits and risks, practical enablers and barriers, professional learning needs, and brief readiness and usefulness ratings. Vignettes invited teachers to reason through realistic situations. For example, one vignette asked participants to imagine an interpreter being absent on the day of instruction and to describe what tools if any could help a deaf student access spoken content. Semi structured interviewing is suited to this aim because it supports consistent coverage of core

topics while allowing participants to introduce examples and concerns that the researchers may not have anticipated. (Kallio et al., 2016). Our guide was reviewed as a team for content coverage and question order and was refined after early interviews to clarify terms and to improve transitions between sections (O'Brien et al., 2014; Tong et al., 2007).

Data collection

Data was collected through one-to-one interview, which lasting thirty to sixty minutes each. With permission from participants the researchers audio-recorded each interview to ensure accurate capture of wording and emphasis.

Data analysis

The researchers approached this qualitative descriptive study in line with naturalistic inquiry, attending to credibility, dependability, confirmability, and transferability in our design, data collection, and reporting (Lincoln & Guba, 1985). Reflexive thematic analysis was used to generate patterns of meaning across the data. The researchers followed the familiar sequence of preparation, coding, theme development, review, definition, and write up. The analysis was managed in a secure workspace. Intercoder reliability was not calculated, as this is not required in reflexive thematic analysis. (O'Connor & Joffe, 2020).

Results

The findings are presented as three overarching themes. Each theme integrates narrative accounts from participants to illustrate patterns of experience and meaning in Akwa Ibom State.

Theme 1. A spectrum of awareness and emerging practice

Across the fifteen interviews teachers described a wide range of awareness and practice with artificial intelligence in deaf education. Some educators reported little or no prior exposure and expressed uncertainty about how such tools work in classrooms. One experienced special educator explained “I do not really know much about artificial intelligence, and I am not sure how it would be used in teaching”. Another teacher added that training and practical demonstrations would be essential because many staff use traditional lesson planning and do not know what tools exist. At the same time several participants described early experimentation that supports lesson preparation and communication access. A deaf teacher described using a phone based captioning app during a lesson and reported that it helped show words and capture speech to text so that pupils could follow along. The same teacher used an assistant for drafting lesson notes and for creating questions and then checked the output against curriculum expectations. A different participant described using an audio assistant that responds when the teacher speaks or types a question and reported that it helped with storytelling and with showing short videos that match a reading text. He said: "I sometimes use storytelling and I show live videos that match the text. I speak and it responds directly, or I type a question and it gives my answer." Another mathematics teacher used a general assistant to prepare for lessons and to break down complex topics before meeting students. One participant said: "I use Google Live Transcribe on my phone during a lesson. It helped me to show words and to speak to text for my pupils." Another teacher said: "They were seeing real time captions coming out on the projector. That was the one I used in class." To varying degrees, teachers have known and utilized AI tools for various educational purposes. Awareness and use exist on a spectrum that runs from curiosity with no prior use to selective use for lesson planning and for real time access in specific lessons.

Theme 2. Belief in transformative potential for access, participation, and independence

Teachers consistently described artificial intelligence as a bridge for access to instruction and for participation in mixed classes. A deaf teacher working in an inclusive setting reported that live transcription would allow understanding of spoken questions from hearing pupils and would help in meetings with administrators. He said: "Using text to speech to text with the deaf has helped in aligning the grammatical structuring of the deaf students”. Another participant envisioned projected captions when interpreters are not available and emphasized that text on screen can support grammar awareness and comprehension. "If I do not have an interpreter I will use voice to text. I will need a

device and I will need internet," he said. Others linked artificial intelligence to increased motivation and to more independent study because students can review saved text or short videos after class. "They have the video and they can watch it over and over. It makes it easy for them to learn independently," said a teacher respondent. One educator summarized the promise as making learning easier and helping students to maintain attention during lessons. Another agrees: "With my experience it helps with reading fluency and with vocabulary acquisition for deaf learners."

Participants also saw possibilities for social inclusion and confidence. Several described how accessible text and visual support help deaf learners join classroom discussion and respond to questions in timely ways. Teachers believed that personalized scaffolds could help close gaps in participation between hearing and deaf students when basic conditions are met. In addition to communication access teachers emphasized the value of lesson planning support. A teacher explained that lesson notes had improved because an assistant provided more information than the teacher imagined and that this helped produce clearer explanations and examples for classroom use. But some teacher also explained that benefits depend on intentional use that fits the content and the learners. Several called for tools that translate spoken words into accurate sign language to support interaction with hearing teachers and peers. Others stressed the importance of responsible use so that learners do not use devices to drift away from task goals during independent work. The theme therefore combines belief in transformative potential with practical judgement about design and classroom routines.

Theme 3. Barriers and the conditions that enable use

Participants described consistent barriers that affect AI adoption in schools. Power supply and internet connectivity were the most frequent constraints in public settings. "Power supply is number one. There is no power supply," a teacher said. Another agreed: "There must be internet. If there is no clear connection the goal cannot be achieved." Teachers reported that schools often lack reliable electricity and bandwidth and that personal data plans are expensive. Some schools have solar or inverters that reduce power interruptions and a few classrooms have projectors and laptops. Even in these settings the number of devices is often not sufficient for group work. Maintenance and funding emerged as barriers because devices and connectivity require money and technical support that schools struggle to provide on a regular basis. A respondent said: "The cost and the sustainability are challenges. The tool is expensive." Other concerns expressed were: "Our Nigerian accent makes the captioning confusing. After that you have to manually edit or you supplement with sign language." "Communication data may be stored or misused. It can be misused by a hacker." "Over relying on this might undervalue the teacher student bond. Children are just focusing on the projector, and they will not even turn to look at you." Several teachers worried that heavy reliance on assistants could make students passive or could weaken teacher student relationships if learners bypass questions in class in favor of later prompts on a device. Others worried about the accuracy of automated sign language and the risk of confusing meanings when tools do not match local sign practices. These concerns did not cancel the perceived benefits, but they indicate the need for practical guidance on classroom management, responsible use, and safeguarding.

Integrative summary

The three themes present a coherent account of practice and possibility in Akwa Ibom State. Awareness and use are emerging and uneven. Educators believe that artificial intelligence can improve access, participation, and independence for deaf learners when basic conditions are met. Significant barriers remain in infrastructure, devices, maintenance, and policy. Teachers are ready to engage with training that is practical and local in focus. They ask for tools that respect Nigerian accents and sign language practices and that can be sustained in schools with limited resources. The findings point to a path that combines infrastructure investment with professional learning, co design with deaf educators, and clear guidance on classroom routines that protect relationships and learning while opening access through technology.

Discussion

This discussion interprets the findings in relation to the four research questions. The focus is on what teachers know and do with artificial intelligence in deaf education, the value they see, and the conditions that shape responsible use in Akwa Ibom State.

Research Question 1. What is the current level of awareness and knowledge of artificial intelligence tools among teachers of deaf students in Akwa Ibom State?

Awareness exists on a continuum that stretches from unfamiliarity to confident early adoption. At one end, several teachers stated that they had heard the term artificial intelligence but could not yet explain how it worked or where it fits within daily teaching. These participants associated the idea with advanced computing or with internet search and requested very simple introductions that start from classroom problems rather than from technical language. This pattern of surface familiarity but low conceptual understanding is consistent with reviews that describe AI awareness among educators in many Global South systems as emergent and uneven (Bali, 2024; Nyamwange, 2025; Opesemowo & Adekomaya, 2024). In the middle of the continuum many teachers were able to name specific functions such as speech to text, captioning, voice recognition, question answering, and translation. They described what these tools seem to do and when they might be useful. At the most confident end a small group reported concrete hands-on experience with captioning, with lesson note assistance, and with quick generation of examples or short reading passages that are later edited for accuracy and level. Similar "small pockets" of early adopters have been reported in Nigerian and Kenyan studies, where a minority of lecturers or teachers experiment with AI tools while colleagues remain at the stage of curiosity or uncertainty (Bali, 2024; Nyamwange, 2025; Sanusi, 2025).

Knowledge development has been largely experiential and self-directed. Teachers described learning by watching colleagues, by trial and error, and by searching for short guides that explain a single function. Formal training is rare, and where it exists it tends to be generic and not tailored to deaf education. This mirrors wider African and Global South evidence that teachers' AI knowledge is driven more by personal initiative than by structured professional learning, and that most professional development is not yet subject- or disability-specific (Bali, 2024; Opesemowo & Adekomaya, 2024; Zhang, 2025). As a result, understanding of benefits and limits is uneven. For example, teachers who have tried captioning understand the importance of microphone placement, classroom acoustics, and careful pacing of speech, while teachers without such experience tend to imagine captioning as a switch that simply works when pressed and are then surprised by errors when they try it in a noisy room or with a complex topic vocabulary. Across interviews there was a strong desire to understand not only how to start but also how to troubleshoot common problems, which resonates with calls in the literature for practical, classroom-level AI literacy for teachers rather than purely conceptual introductions (Bali, 2024; UNESCO, 2023).

Research Question 2. In what ways are teachers currently using artificial intelligence in classrooms?

Teachers reported that projected or handheld text helps deaf learners track key points and makes it easier for the teacher to check understanding before moving on. They also reported that accuracy fluctuates with noise, microphone distance, and domain-specific vocabulary, so they pause often to correct, fingerspell, or paraphrase. This pattern of using AI primarily for real-time support and then compensating for technical limits through pedagogical adjustments aligns with studies that describe AI tools as partial aids for accessibility rather than fully reliable solutions, particularly in low-resource contexts (Opesemowo & Adekomaya, 2024; Polspoel et al., 2024; UNESCO, 2023).

Teachers also use AI assistants to draft lesson notes, to generate short practice questions, to find alternative examples or stories, and to plan sequencing for mixed-ability groups. In this role the tool is a planning partner that can save time and widen the range of examples that a teacher can draw upon. (Ding et al., 2025; Barrera & Azeez, 2024). A few teachers asked assistants to suggest visual support or to outline a short video explanation for later recording, echoing findings that AI can help teachers diversify modalities and create more scaffolded materials, especially when they face large classes and limited preparation time (Bali, 2024; Zhang, 2025).

The third way that teachers use AI is through captioned videos, generated summaries, and saved transcripts as materials for after-class study. They share short texts for vocabulary practice and ask students to reread or annotate these materials during study hall or at home. Some teachers also use question-answering tools during office hours to rehearse explanations before trying them with students. Many teachers prefer to start with planning uses because they can control the pace and avoid technical failures in front of students. When conditions are favorable they extend to live use during

lessons. This staged pattern—beginning with low-stakes preparation tasks and gradually extending into live teaching as infrastructure and norms solidify — is also described in higher-education and systems-level studies in Africa and Latin America (Bali, 2024; Barrera & Azeez, 2024; Opesemowo & Adekomaya, 2024; Nyamwange, 2025).

Conclusion

This study examined how teachers who work with deaf learners in Akwa Ibom State understand and use artificial intelligence. Three themes emerged. Awareness and practice exist on a spectrum that ranges from low familiarity to selective and creative use in planning and in communication access. Teachers believe that artificial intelligence can strengthen access to instruction, participation in class, and independent study when it is fitted to local language and sign practices. Significant barriers remain in power, connectivity, devices, maintenance, and in school level guidance. The pattern across interviews suggests a pragmatic stance. Teachers want simple training in classroom routines, reliable infrastructure, and tools that fit local realities. With these foundations in place, artificial intelligence can support more equitable and language rich learning for deaf students in both special and inclusive schools

Recommendations

The following recommendations are proffered:

1. Colleges of Education providers, ministries of education, and school proprietors should develop iterative, hands-on training programmes that are explicitly anchored in deaf-education use cases. This responds directly to the finding that teachers are interested in AI but lack structured preparation and ongoing support.
2. Technology developers, deaf educators, interpreters, and Deaf community organizations should be brought together in co-design processes to tune AI models to Nigerian accents and to local sign practices. This follows from the finding that current tools are poorly localized and often misrecognize speech and sign.
3. Teachers and school leaders should establish classroom norms that preserve eye contact, turn-taking, and dialogue while using AI-generated text and captions as a shared reference rather than a substitute for interaction. This recommendation arises from concerns that AI tools can unintentionally disrupt visual attention and interactional flow.

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