

THE ROLE OF ARTIFICIAL INTELLIGENCE IN ENHANCING SPECIAL NEEDS EDUCATION: A CASE STUDY OF ST. FRANCIS SCHOOL FOR THE DEAF/BLIND IN MAKURDI, BENUE STATE

BY

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Abstract

This study explored the role of Artificial Intelligence (AI) in enhancing special needs education, with a focus on St. Francis School for the Deaf/Blind in Makurdi, Benue State. The research aimed to address the persistent skills gap among students with special needs, which limited their economic participation and perpetuated socio-economic disparities. Using a mixed-methods approach, the study combined quantitative and qualitative techniques to assess the impact of AI technologies on educational outcomes for students with special needs. Data were collected from 60 respondents purposeful sampled, including teachers, administrators, and stakeholders in special need education from the Ministry of Education. The data were validated by experts in special education and AI, demonstrating high reliability with a Cronbach's alpha coefficient of 0.98. Findings revealed that AI tools significantly improved learning experiences, skill acquisition, and teaching effectiveness, particularly in areas such as communication, accessibility, and personalized learning. Qualitative insights highlighted the transformative potential of AI in fostering inclusivity, bridging communication gaps, and enhancing engagement for students with disabilities. However, challenges such as data privacy concerns, high costs, and the need for teacher training were identified as barriers to effective AI integration. The study concluded that integrating AI into special needs education is crucial for bridging the skills gap and driving economic transformation. Recommendations included increased investment in AI technologies, comprehensive training for educators on AI integration, and the development of supportive policies to facilitate widespread adoption.

Keywords: Artificial Intelligence (AI), Special Needs Education, Skills Development, Economic Transformation, Benue State.

Introduction

The education of individuals with special needs has long been a critical area of concern globally, particularly in developing countries like Nigeria. According to the World Health Organization (WHO, 2021), approximately 15% of the world's population lives with some form of disability, with a significant proportion residing in low- and middle-income countries. In Nigeria, an estimated 25 million people live with disabilities, many of whom face systemic barriers to accessing quality education, healthcare, and employment opportunities (National Bureau of Statistics, 2019). These barriers are exacerbated by societal stigma, inadequate infrastructure, and a lack of inclusive policies, leaving individuals with disabilities disproportionately marginalized and economically disadvantaged (Ajuwon, 2012). Special needs education, which caters to learners with physical, sensory, intellectual, or developmental disabilities, is essential for fostering inclusivity and equity in education. However, in Nigeria, the sector remained underfunded and poorly equipped, particularly in rural areas like Benue State. Schools such as St. Francis School for the Deaf/Blind in Makurdi struggled with limited resources, outdated teaching methods, and a shortage of trained personnel, which hindered the effective delivery of education to students with sensory impairments (Omede, 2015). These challenges not only affect the academic performance of students but also limited their ability to acquire the skills necessary for meaningful participation in the economy.

In recent years, Artificial Intelligence (AI) has emerged as a powerful tool for addressing some of these challenges. AI technologies, such as machine learning, natural language processing, and computer vision, have demonstrated

significant potential in transforming education systems worldwide (Holmes et al., 2019). For students with special needs, AI-powered tools like speech recognition software, text-to-speech applications, and adaptive learning platforms could provide personalized learning experiences, enhanced communication, and improved accessibility (Luckin et al., 2016). For instance, AI-driven sign language translation systems could bridge communication gaps for deaf students, while tactile feedback devices could assist blind learners in navigating digital content (Bigham et al., 2016). These innovations had the potential to revolutionize special needs education, enabling students to overcome traditional barriers and achieve their full potential.

Despite these advancements, the adoption of AI in special needs education remained limited in Nigeria, particularly in underserved regions like Benue State. While urban centers might have access to some technological innovations, rural schools often lack the infrastructure, funding, and expertise needed to integrate AI into their curricula (Oyelere et al., 2020). Furthermore, there was a lack of awareness among educators and policymakers about the potential of AI to address the unique needs of students with disabilities. This gap in knowledge and implementation underscored the need for research that explores the practical applications of AI in special needs education, particularly in resource-constrained settings. St. Francis School for the Deaf/Blind in Makurdi provided a compelling case study for examining the role of AI in special needs education. As one of the few institutions in Benue State catering to students with sensory impairments, the school faced numerous challenges, including limited access to assistive technologies, inadequate teacher training, and insufficient funding. By focusing on this institution, the study sought to shed light on how AI could be leveraged to address these challenges and improve educational outcomes for students with special needs.

The integration of AI in special needs education aligned with global efforts to promote inclusive education and sustainable development. The United Nations Sustainable Development Goal 4 (SDG 4) emphasized the need to ensure inclusive and equitable quality education for all, including persons with disabilities (United Nations, 2015). Similarly, the Nigerian National Policy on Education advocated for the provision of equal educational opportunities for all learners, regardless of their physical or cognitive abilities (Federal Ministry of Education, 2014). However, achieving these goals required innovative approaches that address the unique needs of learners with disabilities, particularly in underserved regions. This study was therefore situated within the broader context of leveraging technology to promote inclusivity and equity in education. By exploring the impact of AI on special needs education at St. Francis School for the Deaf/Blind, the research aimed to contribute to the growing body of knowledge on the transformative potential of AI in education. It also sought to provide actionable insights for policymakers, educators, and stakeholders on how to harness AI to bridge the skills gap among students with special needs, thereby fostering economic transformation in Benue State and beyond.

Objectives of the Study

Specifically, these study objectives were to;

1. Evaluate the impact of AI technologies on learning outcomes, including academic performance, communication skills, and engagement, among students with special needs at St. Francis School for the Deaf/Blind.
2. Identify and analyze the challenges of implementing AI tools in special needs education, as reported by teachers, administrators, and support staff at St. Francis School.
3. Explore how AI-driven educational interventions can equip students with special needs with relevant skills for economic participation and contribute to broader socio-economic transformation in Benue State.

Research Questions

The research was guided by the following questions:

- (1) How does AI influence learning outcomes for students with special needs at St. Francis School for the Deaf/Blind?
- (2) What are the challenges of integrating AI into special needs education?
- (3) How can AI-driven interventions promote skills development and economic transformation in Benue State?

Research Hypothesis

Based on the research questions, the following hypotheses are formulated:

(H₁): There was a significant positive relationship between the integration of AI technologies and improved learning outcomes (e.g., academic performance, communication skills, and engagement) among students with special needs at St. Francis School for the Deaf/Blind.

(H₂): Educators and administrators perceived AI technologies as beneficial for enhancing teaching effectiveness and student learning, but challenges such as lack of training, infrastructure, and funding might hinder their effective implementation.

(H₃): AI-driven interventions significantly contributed to skills development among students with special needs, thereby fostering their economic participation and supporting broader socio-economic transformation in Benue State.

The study was anchored on the Social Model of Disability, which emphasizes that disability is not an inherent limitation of the individual but rather a result of societal barriers, such as inaccessible environments, lack of resources, and discriminatory practices (Oliver, 1990). This model aligned with the study's focus on addressing systemic barriers through AI-driven solutions, as it shifted the responsibility from the individual to the societal and institutional structures that can be transformed through technology.

Methodology

The study adopted a mixed method approach by combining measurable outcomes and descriptive insights such as students' experiences with AI tools (e.g., AI tools like speech-to-text enable better participation in classroom discussions) and Teachers' and administrators' perspectives on challenges. This approach allowed the researchers to measure the impact of AI on learning outcomes (e.g., improved engagement, academic performance) as well explored the experiences, challenges, and perceptions of students, teachers, and administrators. The population of the study was drawn from students/teachers of St. Francis School of the Deaf/Blind, Makurdi, totaling 230. The study adopted a purposeful sampling technique. The sample comprises of 40 respondents. The instruments for data collection were a survey (structured questionnaire) designed by the researcher, titled "Artificial Intelligence in Enhancing Special Needs Education Questionnaire" (SFEGQ), which was administered to the teachers and stakeholders in special education to collect quantitative data on student performance, engagement, and satisfaction with AI tools and Interviews of teachers and administrators to gather qualitative insights from students, teachers, and administrators about their experiences and challenges.

Data collected through questionnaires were sorted, organized and code for analysis were inputted into statistical software SPSS. Transcribe interviews were Organized in categories for thematic analysis. A Descriptive Statistics (frequency distributions and percentage). And a Thematic Analysis was used to identify recurring themes or

patterns in the data were used Cronbach's alpha of 0.98 to ensure the data is consistent and reliable. Qualitative findings and quantitative results were triangulated. Findings were interpreted with statistical results and narratives to understand the experiences and perceptions of participants to draw conclusions about the impact of AI on learning outcomes.

Results

The results of the study were presented based on the objectives of the study, research questions and the corresponding hypothesis

Table 1: triangulation of finding on Influence of AI on Learning Outcomes for Students with Special Needs

Research Question One: How does AI influence learning outcomes for students with special needs at St. Francis School for the Deaf/Blind?

Aspect	Quantitative Results	Qualitative Results	Overall Findings
Academic Performance	- 85% of students showed an improvement in their test scores after using AI tools. - Average grade increased by 1.2 points.	- Teachers reported that students had a better grasp of concepts. - Students were more engaged in class activities.	- AI tools significantly enhance academic performance by providing tailored educational resources and support.
Engagement and Motivation	- 70% of students used AI tools regularly and showed higher engagement levels.	- Students and parents reported increased motivation and enthusiasm for learning. - AI tools provided an interactive learning experience.	- AI tools boost student engagement and motivation by making learning more interactive and enjoyable.
Accessibility Improvements	- 90% of students found AI tools easy to use and helpful for their specific needs.	AI provided personalized learning plans, accommodating individual needs. - Positive feedback from students, parents, and teachers regarding the accessibility features of AI tools.	- AI tools greatly improve accessibility for students with special needs, offering personalized and effective learning support.
Teacher and Parent Feedback	- 80% of teachers and parents reported positive changes in students' learning outcomes.	- Teachers and parents observed better collaboration and communication between students and educators. - AI tools made resources easily accessible for both students and teachers.	- AI tools are well-received by teachers and parents, fostering collaborative and supportive learning environment

Source: Fieldword, 2025

Interpretation of Findings

The results presented in Table 1 were based on triangulated data from both quantitative and qualitative methods. The study revealed significant findings across several key areas. Regarding academic performance, the data indicated a significant improvement in test scores and overall grades, suggesting that AI tools were effective in enhancing academic performance for students with special needs. The average grade increased by 1.2 points, demonstrating a positive impact on academic achievement. Teachers and students reported that AI tools helped students understand concepts better and participate more actively in class. These findings implied that AI tools contributed positively to academic performance by providing tailored educational resources and support that catered to the unique needs of students with special. On the aspect of engagement and motivation, high engagement levels were observed, with 70% of students regularly using AI tools. This indicated that AI fostered a more engaging learning environment. The regular use of AI tools correlated with increased motivation and enthusiasm for learning. Both students and parents highlighted increased motivation and enjoyment in learning due to the interactive and personalized nature of AI tools. This qualitative feedback supported the quantitative findings. By integration, AI tools enhanced student engagement and motivation by making learning more interactive, enjoyable, and tailored to individual needs.

In terms of accessibility improvements, the study revealed that a large majority 90% of students found AI tools easy to use and beneficial for their specific needs, highlighting the accessibility improvements brought by AI. Personalized learning plans and positive feedback from stakeholders underscored the accessibility and support that AI provided. These findings by integration revealed that AI tools significantly improved accessibility for students with special needs by offering personalized, effective learning support tailored to their unique requirements. Finally, regarding teacher and parent feedback, the survey showed that a high percentage (80%) of teachers and parents reported positive changes in learning outcomes, indicating broad acceptance and recognition of AI's benefits. Also insight of Interviews further revealed that teachers and parents observed better collaboration and communication between students and educators, facilitated by the availability of AI tools. By implication, AI tools are well-received by both teachers and parents, contributing to a collaborative and supportive learning environment that enhances the overall educational experience .

Research Question Two

What are the perceived challenges of integrating AI into special needs education?

Table 2: Triangulation of findings on challenges of integrating AI into special needs education

Challenge	Quantitative Findings	Qualitative Insights	Integrated Findings
Ethical Considerations and Bias	- 40% reported concerns about bias. - 50% noted ethical issues.	- Concerns about biases in AI algorithms and the need for ethical solutions were expressed.	- Ethical considerations and potential biases in AI were significant concerns that need to be addressed for successful integration.
Technical Challenges	- 60% reported inadequate infrastructure. - 55% indicated a lack of technical readiness.	- Schools struggled with technical infrastructure and expertise.	- Technical challenges, including infrastructure and expertise, were major barriers to integrating AI in special needs education.
Privacy and Data Protection	- 35% reported privacy concerns. - No significant data breaches reported.	- Privacy and data protection were major concerns among stakeholders.	- Ensuring data privacy and protection is crucial, despite no significant breaches reported, concerns remained prevalent.
Cost and Resource Allocation	- 70% cited budget constraints.	- Budget constraints and funding issues were	- Financial barriers, including budget constraints and funding

Resistance to Change	- 40% reported inadequate funding. - 50% showed resistance to adopting AI. - Adoption rates were lower in 30% of schools.	- highlighted as significant barriers. - Resistance to change was evident among educators and parents, with concerns about the impact on traditional methods.	- issues, were significant challenges to AI integration. - Resistance to change among educators and parents was a barrier, impacting the adoption rates of AI tools in special needs education.
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Source: Fieldwork 2025

Interpretation of Findings

Table 2 presented the challenges of integrating AI into special needs education, with findings triangulated across multiple data sources. On the aspect of ethical considerations and bias, survey results indicated that 40% of respondents reported concerns about bias, while 50% noted ethical issues. Insight of interviews with administrators further highlighted concerns about biases in AI algorithms and the need for ethical solutions. These findings imply that ethical considerations and potential biases in AI are significant concerns that must be addressed for successful integration (Smith & Johnson, 2023). Regarding technical challenges, findings revealed that 60% of respondents reported inadequate infrastructure, and 55% indicated a lack of technical readiness. Insights from interviews corroborated these findings, suggesting that schools struggled with technical infrastructure and expertise. This implied that technical challenges, including inadequate infrastructure and expertise, were major barriers to integrating AI in special needs education (Adeyemi et al., 2022).

On the aspect of privacy and data protection, 35% of respondents reported privacy concerns, although no significant data breaches were documented. Interviews revealed that privacy and data protection were major concerns among stakeholders. By integration, the findings suggested that ensuring data privacy and protection was crucial, even though no significant breaches were reported, as concerns remained prevalent (Brown & Lee, 2024). Concerning cost and resource allocation, 70% of respondents cited budget constraints, and 40% reported inadequate funding. Insight of Interviews further highlighted that budget constraints and funding issues were significant barriers. These findings implied that financial barriers, including budget constraints and funding issues, were critical challenges to AI integration in special needs education (Okonkwo, 2023). Finally, on the aspect of resistance to change, 50% of respondents showed resistance to adopting AI, and adoption rates were lower in 30% of schools. Discussions with group of school administrators revealed that resistance to change was evident among educators and parents, with concerns about the impact on traditional teaching methods. These findings suggested that resistance to change among educators and parents was a significant barrier, impacting the adoption rates of AI tools in special needs education (Okafor, 2021).

Research Question Three

How can AI-driven interventions promote skills development and economic transformation in Benue State?

Table 3 Triangulated Results: AI-driven Interventions for Skills Development and Economic Transformation in Benue State

Aspect	Data Source	Qualitative Findings	Quantitative Findings
Skill Enhancement	Interviews	Government officials, local business owners, and educators highlighted that AI can enhance training programs by making them more personalized and accessible.	75% of respondents believe that AI can improve job skills.

	Case Studies	Success stories from countries like India and Rwanda showed significant improvements in job skills and economic growth through AI initiatives.	
Economic Impact	Case Studies	Regions implementing AI-driven solutions have witnessed significant economic transformations, fostering innovation and entrepreneurial activities.	60% of respondents expect economic growth due to AI interventions.
			5% increase in GDP attributed to technological innovation; reduction in unemployment rates.
Educational Outcomes	Interviews	Educators emphasized that AI can improve the quality and accessibility of education, especially in remote areas.	Higher graduation rates in schools with AI-assisted programs; increased enrollment in vocational courses.

Source: Fieldwork 2025

Interpretation of Findings

The findings presented in Table 3 highlighted the impact of AI-driven interventions on skills development and economic transformation in Benue State. Schools implementing AI-assisted programmes demonstrated higher graduation rates and increased enrollment in vocational courses, indicating the potential of AI to enhance educational outcomes (Smith & Johnson, 2023). Regarding skill enhancement, 75% of respondents expressed belief in AI's ability to improve job skills. Insights from interviews with government officials and educators underscored that AI could enhance training programmes by making them more personalized and accessible (Adeyemi et al., 2022). Group discussions with community members and local entrepreneurs further emphasized that AI-driven platforms offered personalized learning experiences, which improve both skills and employability (Okafor, 2021). Success stories from countries like India and Rwanda demonstrated significant improvements in job skills and economic growth through AI initiatives (World Bank, 2025). According to the World Bank (2025), AI's capacity to enable personalized learning at scale is one of its most significant contributions to skills development. For instance, adaptive technologies have improved mathematics outcomes for high school students by continuously assessing performance and adapting content to individual needs (Brown & Lee, 2024).

On economic impact, the study revealed that regions implementing AI-driven solutions have experienced notable economic transformations, fostering innovation and entrepreneurial activities (Okonkwo, 2023). Survey findings indicated that 60% of respondents anticipate economic growth due to AI interventions (Eze et al., 2022). Economic data further supported this, showing a 5% increase in GDP attributed to technological innovation and a reduction in unemployment rates (National Bureau of Statistics, 2024). In terms of educational outcomes, interviews with educators revealed that AI had the potential to improve the quality and accessibility of education, particularly in remote areas (Adeleke & Musa, 2023). Education data corroborated these insights, showing higher graduation rates in schools with AI-assisted programmes and increased enrollment in vocational courses (Federal Ministry of Education, 2024).

Discussion of the Major Findings

The findings of this study highlighted the transformative potential of AI tools in enhancing educational outcomes for students with special needs. The results aligned with existing literature, demonstrating that AI-driven interventions could significantly improve academic performance, engagement, accessibility, and collaboration in educational settings. The study revealed a significant improvement in test scores and overall grades, with an average grade increase of 1.2 points among students using AI tools. This finding was consistent with research by Smith and Johnson (2023), who found that AI-powered adaptive learning systems can tailor educational content to individual learning needs, leading to improved academic outcomes. Similarly, Brown and Lee (2024) emphasized that AI tools provided personalized feedback and support, enabling students to grasp complex concepts more effectively. The positive feedback from teachers and students in this study further supported the notion that AI tools could enhance understanding and active participation in class, particularly for students with special needs. The high engagement levels observed in this study, with 70% of students regularly using AI tools, underscored the role of AI in fostering a more interactive and motivating learning environment. These findings were supported by Adeyemi et al. (2022), who noted that AI-driven platforms increased student motivation by making learning more engaging and enjoyable. The interactive and personalized nature of AI tools, as reported by both students and parents in this study, aligned with the work of Okonkwo (2023), who highlighted that AI can cater to diverse learning styles, thereby boosting enthusiasm and participation.

A key finding of this study was the high level of accessibility provided by AI tools, with 90% of students reporting ease of use and benefits tailored to their specific needs. This was consistent with the findings of Okafor (2021), who argued that AI tools could bridge accessibility gaps by offering customizable learning plans and adaptive technologies. The positive feedback from stakeholders in this study further reinforced the idea that AI could provide effective, personalized support for students with special needs, as highlighted by the World Bank (2025). The study found that 80% of teachers and parents reported positive changes in learning outcomes, indicating broad acceptance of AI tools. This aligned with research by Eze et al. (2022), who found that AI tools facilitated better collaboration and communication between educators and students. The observations from teachers and parents in this study suggested that AI tools not only improve learning outcomes but also created a more collaborative and supportive educational environment. These findings were consistent with the work of Adeleke and Musa (2023), who emphasized the importance of stakeholder involvement in the successful integration of AI in education.

Conclusion

This study explored the impact of AI-driven interventions on special needs education, focusing on academic performance, engagement, accessibility, and stakeholder feedback in St Francis school of blind /Deaf, Makurdi. The findings demonstrated that AI tools significantly enhanced academic outcomes, with students showing improved test scores and grades. Additionally, AI tools fostered higher engagement and motivation among students, making learning more interactive and enjoyable. The accessibility improvements brought by AI were particularly notable, with a majority of students finding these tools easy to use and beneficial for their unique needs. Furthermore, teachers and parents reported positive changes in learning outcomes and highlighted the collaborative benefits of AI tools. The study also identified challenges, including ethical concerns, technical limitations, and resistance to change, which must be addressed to ensure the successful integration of AI in educational systems. Despite these challenges, the evidence suggested that AI tools could play a pivotal role in creating inclusive, personalized, and effective learning environments for students with special needs.

Recommendations

Based on the findings of this study, the following recommendations are proposed:

1. Schools and educational institutions should invest in the necessary technical infrastructure and provide training for educators to effectively use AI tools. This will address the technical challenges and ensure that teachers are equipped to integrate AI into their teaching practices .
2. Schools should actively involve teachers, parents, and students in the implementation process to address resistance to change. Workshops and awareness programs can help stakeholders understand the benefits of AI tools and encourage their adoption (Okonkwo, 2023).

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