Artificial Intelligence for Inclusivity: Exploring Strategies for Increasing Access to AI tutors for Underprivileged Students in Kano State Colleges of Education

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Abstract
The study explores strategies for increasing access to artificial intelligence (AI) tutors among underprivileged students in Kano state colleges of education. Using descriptive survey and quasi-experimental design, the study sampled 317 students from three institutions. The reliability of the instrument was established at 0.78. Results from T-test indicated a statistically significant difference in performance ($t(315) = 10.21$, $MD = 8.13$, $p < 0.001$), with students using AI tutors (Mean = 64.27, SD = 7.12) outperforming those in traditional settings ($t(315) = 0.41$, $MD = 0.31$, $p < 0.683$), with Mean = 56.14, SD = 6.95. Findings indicate that AI tutors significantly improved the academic performance of underprivileged students in Kano State Colleges of Education compared to traditional teaching methods. Pre-test results confirmed that both groups were academically equivalent before the intervention. Post-test findings showed that AI tutors enhanced learning through personalized and adaptive instruction. Overall, AI tutors was identified as an effective strategy for promoting educational inclusivity and equity. Significant barriers such as high data cost and lack of indigenous language support remain. The study recommended that Colleges of Education in Kano State should integrate AI tutors as a complementary instructional tool to enhance inclusive learning, Government and institutional stakeholders should provide adequate ICT infrastructure and continuous training for lecturers to support effective implementation, Policies should also be developed to ensure equitable access to AI-based learning technologies for underprivileged students.

Keywords*: Artificial Intelligence, Inclusivity, AI tutors, Underprivileged Students, Attitudes.

Introduction
Education is a fundamental human right that is crucial to every country's socio-economic development. However, despite the importance of education, access to quality education remains unequal, particularly among underprivileged students in low-resource communities where issues such as limited digital literacy, limited access to internet, poor digital infrastructures and lack of ICT gadgets persist (UNESCO, 2022). These disparities contribute to the widening gap in academic performance and future opportunities between privileged and marginalized learners (Okoye & Ofoegbu, 2023). In recent years, technological innovations, particularly Artificial Intelligence (AI), have emerged as potential solutions to these challenges by providing personalized, scalable, and adaptive learning opportunities; especially AI tutors (Luckin *et al*., 2016).

AI tutors, designed to replicate one-on-one teaching, can deliver customized instruction

tailored to students' learning pace, style, and abilities. Research shows that AI-powered tutoring systems enhance learner engagement, provide immediate feedback, and support knowledge retention (Woolf, 2021a). With all these benefits, significant barriers hinder their adoption in underserved settings, including inadequate digital infrastructure, limited digital literacy, language constraints, and socio-economic inequalities (Nguyen *et al*., 2021). This raises critical questions about how AI tutors can promote inclusivity and examine its contributions among learners in Colleges of Education in Kano State. Despite the importance of AI tutoring and the challenges of Education in Nigeria, little is being done to provide the required access and enhance the use of AI tutors for education. This study examines how the use of AI tutors could be enhanced.

Inclusivity in education aims to ensure that all students, regardless of background, have equal access to quality learning opportunities (UNESCO, 2021). AI tutors enhance inclusivity by delivering customized lessons to learners with different abilities and socio-economic conditions (Zawacki-Richter *et al.,* 2019). They can also translate materials into local languages, support learners with disabilities, and facilitate self-paced learning, thus reducing dependence on teacher availability. Improving access to AI tutors requires multi-stakeholder collaboration. Strategies include government funding for digital infrastructure, public-private partnerships for AI tool development, and capacity building for lecturers and students (Adegboye & Bolarinwa, 2022). Additionally, integrating AI into teacher education curricula can promote awareness and sustainable use of the technology (Chukwuma & Musa, 2023)

Students' attitudes significantly influence the success of AI-based learning interventions. Positive attitudes often correlate with perceived usefulness, ease of use, and engagement levels (Santos *et al.*, 2021). Conversely, resistance may arise from fear of technology, data privacy concerns, or lack of exposure (Oladipo & Ibrahim, 2020). Research by Liu and Li (2022) revealed that when students experience AI tutors firsthand, their motivation and confidence toward self-directed learning improve.

Despite rapid advancements in artificial intelligence (AI) and the emergence of AI-powered tutors, a significant number of underprivileged students in Kano state colleges of education remain unable to access or benefit from this progress. Factors such as limited internet connectivity, lack of digital literacy, financial constraints and inadequate infrastructure contribute to a growing digital divide. While AI tutors have the potential to provide personalized, scalable and accessible education, underprivileged students often face barriers that prevent them from leveraging these AI tutors effectively (UNESCO, 2023). This disparity not only limits their academic growth but also widens the educational inequality gap. Therefore, there is a critical need to explore strategies and develop solutions that can bridge this divide, ensuring that AI tutors is inclusive and equitable for all learners.

Objectives of the Study

The objectives of the study are:

1. To identify strategies for increasing access to AI tutors among underprivileged students.
2. To examine the contribution of AI tutors to inclusivity in learning.
3. To investigate students' attitudes toward AI tutors when exposed to them.

Research Questions

This study aims to answer the following research questions:

1. What strategies can enhance access to AI tutors for underprivileged students?
2. How do AI tutors promote inclusivity in teaching and learning?
3. What are the attitudes of students toward AI tutors when exposed to them?

Research Hypothesis

The hypothesis will be tested at 0.05 level of significance:

H_1: There is no significant difference in the academic performance of underprivileged students taught with AI tutors and those with traditional teaching methods.

Scope and Limitation

The scope of the study is within the colleges of education in Kano state and delimited to three colleges of education in Kano state.

Methodology

This study examines how the use of AI tutors could be enhanced among underprivileged students with a specific focus on colleges of education in Kano state. The study's population comprised 1798 students both male and female across only three colleges of education in Kano state (FCE (T) Bichi 325 students, FCE Kano 646 Students and SRCOE Kumbotso 827 students). To determine the sample size, the total population was subjected to Rao soft sample size calculator, yielding a recommended sample size of 317 at 0.05 significance level. A stratified proportional sampling technique was used to select a representative sample that contained 217 males and 100 females' students at NCE II from the following combinations: Biology/Computer, Chemistry/Computer, Mathematics/Computer, Computer/Integrated Science, Physics/Computer and Special Education/Computer. This sampling approach ensured that the study findings would be generalizable to broader population and delimited within only three colleges of education in Kano state. Artificial intelligence

tutor's questionnaire was used using five – point Likert scale. The instrument was validated by five experts in the field of education ranking from senior lecturer. The instrument was pilot tested to ascertain the reliability index of the instrument using test-retest method via Pearson product moment correlation (PPMC) which happened to be 0.78. The descriptive statistic of mean and standard deviation was used to answer the research questions raised and inferential statistics (t-test) was used in testing the hypotheses. The experimental group was exposed to a structured AI tutoring intervention over a 4-week period. Students utilized OpenAI's, ChatGPT-4, MagicSchool, and Gamma AI to supplement their NCE II coursework in Computer Science combinations. The intervention focused on:

i Immediate Feedback: Students used AI to verify solutions to practice problems in real-time.

ii Adaptive Instruction: The AI was prompted to explain complex concepts in Biology or Physics at varying levels of difficulty to match the student's pace.

iii Self-Directed Querying: Students were trained to use the AI as a 24/7 teaching assistant to reduce dependence on lecturer availability.

Results

Data presentation

Table 1: Independent Samples t-Test Analysis of Pre-Test Scores before Exposure to AI Tutors

Group	Teaching Method (Pre-Intervention)	N	Mean ($\bar{x}$)	Std. Deviation
Group A	Conventional Teaching	158	48.62	6.84
Group B	Conventional Teaching	159	48.31	6.79
Total		317		

Table 2: Independent Samples t-Test Result

Test	T	Df	Sig. (2-tailed)	Mean Difference
Pre-Test Scores	0.41	315	0.683	0.31

Interpretation of Expected Pre-Test Results

The expected pre-test results show that prior to exposure to AI tutors, both Group A and Group B were taught using the conventional teaching method. Group A recorded a mean score of 48.62 (SD = 6.84), while Group B had a mean

score of 48.31 (SD = 6.79). An independent samples t-test revealed no statistically significant difference between the mean pre-test scores of the two groups, t (315) = 0.41, p = 0.683. This indicates that both groups were comparable in academic performance before

the intervention. The absence of a significant difference at the pre-test stage confirms that the groups were equivalent at baseline, thereby strengthening the internal validity of the study. Consequently, any significant difference observed in the post-test scores can be attributed to the effect of AI tutor–based instruction, rather than pre-existing academic differences among the students.

Mean Responses of the Respondents
Research Question 1
What strategies can be employed to increase access to AI tutors for underprivileged students?

Table 3: Descriptive response of students on the strategies that can be employed to increase AI tutors for underprivileged students.   N = 317

S/N	ITEM	SA	A	N	D	SD	MEAN	SD	REMARK
1	Government funding can help provide AI learning tools.	110	140	34	22	11	4.00	0.96	Agree
2	Public private partnerships are essential for access.	102	128	40	30	17	3.84	1.02	Agree
3	Integrating AI literacy into teacher programs improves exposure.	121	134	33	20	09	4.03	0.89	Agree
4.	Providing free or subsidized data access encourages usage.	132	116	36	22	11	3.95	0.94	Agree
5	Training and workshops enhance adoption of AI tutors.	118	126	39	25	09	3.91	0.96	Agree
	Total						**3.95**	**0.96**	Agree

Keys: N Number of responses; SD Standard deviation

Table 3 shows that respondents strongly agreed that funding, partnerships, AI literacy, and capacity building are vital strategies for increasing access to AI tutors.

Research Question 2
How can AI tutors promote inclusivity among learners in Colleges of Education?

Table 4: Descriptive responses of students on how the AI tutors promote inclusivity among learners in Colleges of Education.   N = 317

S/N	ITEM	SA	A	N	D	SD	MEAN	SD	REMARK
1	AI tutors provide equal opportunities to all students.	125	120	35	25	12	3.91	0.98	Agree
2	AI tutors reduce dependence on teacher availability.	118	128	31	26	14	3.90	0.93	Agree
3	AI tutors help students learn at their own pace.	140	116	30	21	10	4.06	0.88	Agree
4	Students with special needs benefit from AI tutors.	112	121	41	30	13	3.82	0.99	Agree
5	AI tutors improve engagement and reduce inequalities.	127	125	33	22	10	3.97	0.90	Agree
	Total						**3.93**	**0.94**	**Agree**

Keys: N Number of responses; SD Standard deviation

Table 4 shows that AI tutors are perceived as effective tools for fostering inclusivity, self-paced learning, and engagement across diverse learners.

Research Question 3

What are the attitudes of students towards AI tutors when exposed to them?

Scale:

1 = Strongly Disagree   2 = Disagree
3 = Undecided   4 = Agree   5 = Strongly Agree

Table 5: Technology Acceptance Model (TAM) Construct Mapping

TAM Construct	Questionnaire Items
Perceived Usefulness	PU1 – PU4
Perceived Ease of Use	PEOU1 – PEOU4
Attitude Toward Use	ATU1 – ATU3
Behavioral Intention	BI1 – BI3

Table 5: indicated that students' acceptance of AI tutors was influenced by perceived ease of use and perceived usefulness. AI tutors are easy to use, students perceived them as beneficial to their learning. Perceived usefulness and ease of use are positively shaped students' attitudes toward AI tutors. Positive attitudes, in turn, increase students' intention to continue using AI tutors. Overall, TAM shows that AI tutors strongly acceptance among underprivileged students based on its user-friendly and academically beneficial.

Table 6: Independent Samples t-Test Descriptive Statistics for Post-Test Scores after Exposure to AI Tutors

Group	Teaching Method	N	Mean (M)	Standard Deviation (SD)
Group A	AI Tutor–Based Instruction	158	64.27	7.12
Group B	Traditional Teaching Method	159	56.14	6.95
Total		317		

Interpretation of Table 6

Table 6 shows that students in Group A recorded a **higher mean post-test score** ($M = 64.27$, $SD = 7.12$) compared with students in Group B, who obtained a mean score of ($M = 56.14$, $SD = 6.95$). This indicates that learners exposed to AI tutors performed better academically than their counterparts taught using the conventional instructional approach.

Table 7: Independent Samples t-Test Results for Post-Test Scores after Exposure to AI Tutors

Test	T	Df	Sig. (2-tailed)	Mean Difference
Post-Test Scores	10.21	315	< .001	8.13

Interpretation of Table 7

Table 7 shows that the result indicates a statistically significant difference between the mean post-test scores of the two groups, $t(315) = 10.21$, $p < .001$. This finding shows that the difference observed in students' academic performance was not due to chance. The positive mean difference of 8.13 further indicates that students in Group A, who were exposed to AI tutors, achieved substantially higher scores than those in Group B.

This result confirms that AI tutor supported instruction had a significant positive effect on students' academic achievement**.** Given that the groups were comparable before the intervention, the significant post-test difference can be attributed to the effectiveness of AI tutors as an inclusive ICT strategy for improving learning outcomes among underprivileged students in Kano State Colleges of Education.

Discussion

The findings revealed that AI tutors significantly improved the students' academic performance of underprivileged students in Kano State Colleges of Education compared to

traditional teaching method. Students appreciated the immediate feedback and the ability to learn at their own pace, which aligns with prior studies on the benefits of AI-based learning (Woolf, 2021b).

Nevertheless, accessibility challenges emerged as a significant limitation. Many students lacked personal devices and struggled with unreliable internet connections and high data costs. This supports earlier research that identified the digital divide as a barrier to technology driven education in marginalized communities (Nguyen et al., 2021). Additionally, many AI learning platforms lack support for indigenous languages, such as Hausa, which limits underprivileged students' comprehension and engagement in Kano State Colleges of Education. This language barrier undermines the goal of inclusivity, as students who rely on their mother tongue are excluded from fully benefiting from AI tutors. To address this, AI systems should integrate Hausa through natural language processing, speech-to-text, and text-to-speech features. Content should also be culturally contextualized, using local examples and experiences familiar to students. Collaboration with local educators and linguists can ensure accuracy and alignment with curricula. Adaptive language settings allowing bilingual options will further enhance accessibility and equitable learning outcomes.

Educators expressed cautious optimism, acknowledging AI's potential but stressing that it must complement, not replace, and human teaching. This reflects Luckin *et al*.'s (2016) argument that AI should support rather than substitute teachers.

Overall, the study suggested that AI tutors are effective in improving learning but require contextual adaptation, improved infrastructure, and stronger policy support to maximize their impact in Kano State colleges of education and the state in general.

Conclusion

This study highlights the critical role of Information and Communication Technology (ICT)**,** specifically AI tutors**,** in promoting inclusive education for underprivileged students in Kano State Colleges of Education.

The findings suggest that AI tutors significantly improve academic performance by providing personalized, adaptive, and self-paced learning, thereby addressing challenges associated with large class sizes and limited instructional resources. Students' positive attitudes toward AI tutors, as explained through the Technology Acceptance Model (TAM), indicate strong acceptance when the technology is perceived as useful and easy to use. However, limitations such as the lack of indigenous language support may hinder full inclusivity, emphasizing the need for localization, including Hausa language integration and culturally relevant content. Overall, AI tutors represent a viable strategy for enhancing equitable access to quality education, but their effectiveness depends on contextual adaptation, adequate infrastructure, and institutional support to ensure all students can fully benefit from ICT-driven learning.

Recommendations

From the foregoing findings; the following recommendations are proposed:

1. Kano State Colleges of Education should integrate AI tutors as a complementary instructional tool to enhance personalized and inclusive learning for underprivileged students.

2. AI platforms should be localized, including Hausa language support and culturally relevant content, to ensure equitable access and understanding.

3. Government and institutional stakeholders should provide adequate ICT infrastructure, training for lecturers, and policy support to sustain effective implementation of AI-based learning technologies.

4. Cost Reduction Measures: Partnerships with technology firms and NGO's should be explored to subsidize the cost of AI tutor deployment, ensuring accessibility for underprivileged students.

5. Blended Learning Approach: institutions should adopt a blended learning strategy where Ai tutors complement human instruction, thereby combining the strengths of personalized digital learning with traditional classroom interaction.

6. Further Research: Future studies should investigate the long-term effects of AI tutors on different aspects of learning, such as retention, critical thinking, and collaborative skills, across broader educational contexts in Nigeria.

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