



POLAC MANAGEMENT REVIEW (PMR)
DEPARTMENT OF MANAGEMENT SCIENCE
NIGERIA POLICE ACADEMY, WUDIL-KANO



UNDERSTANDING THE ADOPTION OF ARTIFICIAL INTELLIGENCE TOOLS IN SECONDARY SCHOOL LEARNING: SOCIOECONOMIC AND INSTITUTIONAL EVIDENCE FROM NASARAWA LGA, KANO STATE

Sadiq, A., S. Department of Agric Education, School of Vocational & Entrepreneurship Education, Kano State College of Education and Preliminary Studies Kano, Nigeria.

Adamu, Sanusi Department of Business Education, School of Vocational & Entrepreneurship Education, Kano State College of Education and Preliminary Studies Kano, Nigeria.

Aishatu A., Zubair Department of Business Education, School of Vocational & Entrepreneurship Education, Kano State College of Education and Preliminary Studies Kano, Nigeria.

Abstract

The adoption of Artificial Intelligence (AI) tools in education has attracted increasing attention because of their potential to enhance teaching and learning outcomes. However, empirical evidence on the socioeconomic and institutional factors influencing AI adoption among secondary school students in Nigeria remains limited. This study examined the determinants of AI tool adoption among Senior Secondary School (SSS) students in Nasarawa Local Government Area, Kano State. Data were collected from 240 students selected through a multistage sampling technique from eight purposively selected secondary schools, comprising four public and four private schools. A structured questionnaire was administered and binary logistic regression was used to analyse the determinants of AI-enabled learning tool adoption. The results revealed that parental income significantly increased the adoption of smartphones ($p < 0.01$) and positively influenced the use of tablet computers and smart interactive boards ($p < 0.10$). Parental educational attainment significantly influenced the adoption of smartphones ($p < 0.10$) and laptop computers ($p < 0.05$), while school type significantly affected the use of desktop computers and AI-enabled e-readers ($p < 0.05$). Digital literacy significantly enhanced the adoption of laptop computers ($p < 0.01$), desktop computers and smart interactive boards ($p < 0.05$). Cultural beliefs significantly influenced smartphone adoption ($p < 0.05$), whereas the availability of digital infrastructure significantly promoted the use of tablet computers, laptop computers and desktop computers ($p < 0.05$). The study concludes that socioeconomic, institutional and sociocultural factors are key drivers of AI adoption among secondary school students. It recommends strengthening digital infrastructure, improving digital literacy and implementing supportive educational policies to promote equitable AI integration in secondary education.

Keywords: Artificial Intelligence; AI Adoption; Digital Learning; Digital Literacy; Secondary Education.

1. Introduction

The rapid advancement of Artificial Intelligence (AI) has transformed educational systems by redefining teaching, learning and knowledge acquisition. AI-powered technologies, including intelligent tutoring systems, adaptive learning platforms, virtual teaching assistants and automated assessment tools, are increasingly being adopted to personalize learning experiences, improve instructional efficiency and enhance student engagement. These technologies facilitate individualized learning, provide immediate

feedback, support problem-solving skills and foster the digital competencies required for participation in the knowledge-based economy (Alzahrani & Seth, 2021). Consequently, AI has emerged as a strategic tool for improving educational quality and expanding access to innovative learning opportunities.

Despite these global developments, the adoption of AI technologies in education remains uneven, particularly in developing countries where inadequate technological infrastructure and limited digital capacity continue to constrain implementation. In

Nigeria, although national education policies emphasize the importance of digital technologies in improving educational quality and preparing learners for a technology-driven society, the integration of AI into secondary education remains at an early stage (Eze, Okonkwo, & Chukwuemeka, 2023). Many secondary schools, especially those located in rural and semi-urban areas, continue to experience inadequate digital infrastructure, unreliable electricity supply, poor internet connectivity, limited access to digital devices and insufficient digital literacy. These challenges restrict students' opportunities to benefit from AI-enabled learning technologies and widen existing educational inequalities.

The adoption of AI in education is shaped by a complex interaction of socioeconomic, institutional and sociocultural factors. At the household level, parental income, educational attainment and ownership of digital devices significantly influence students' access to AI-supported learning resources (Omodan & Ige, 2021). Students from economically advantaged households are more likely to possess smartphones, computers and reliable internet access, enabling them to utilize AI-enabled educational platforms effectively. Similarly, parents with higher educational attainment are generally better equipped to support their children's engagement with emerging digital technologies, thereby promoting positive learning outcomes (Obi & Nwachukwu, 2020).

Institutional factors also play a critical role in determining the successful adoption of AI technologies within schools. Effective implementation requires adequate digital infrastructure, including reliable electricity, internet connectivity, computer laboratories and AI-compatible learning devices (Eze & Okonkwo, 2022). School ownership further influences the availability of these resources, as private schools often possess greater financial capacity to invest in educational technologies than public schools. In addition, institutional support through ICT policies, teacher capacity development, technical assistance and continuous digital literacy programmes enhances the integration and effective utilization of AI-enabled learning tools in classroom instruction (Adebayo & Ibrahim, 2022).

Beyond socioeconomic and institutional conditions, the successful adoption of AI depends on users' digital competencies and the broader sociocultural environment. Students require adequate digital literacy to effectively utilize AI-enabled learning tools, while societal attitudes, cultural norms and community perceptions can either facilitate or hinder technology adoption. In some communities, concerns regarding technology, cultural traditions and religious values continue to influence the acceptance and use of AI in educational settings (Adebanjo & Abubakar, 2023).

Although previous studies have examined digital learning, information and communication technologies (ICT) and AI applications in education, most have focused on higher education, teachers' adoption of educational technologies, or general ICT utilization. Empirical evidence on the socioeconomic and institutional determinants of AI tool adoption among secondary school students in Nigeria remains scarce. Furthermore, few studies have examined how these determinants differ between public and private secondary schools at the local government level, where disparities in educational resources and digital infrastructure are often most pronounced. This gap limits the availability of evidence needed to design context-specific policies that promote equitable access to AI-enabled learning opportunities.

Against this background, this study investigates the socioeconomic and institutional factors influencing the adoption of AI-enabled learning tools among Senior Secondary School (SSS) students in Nasarawa Local Government Area, Kano State, Nigeria. Specifically, the study examines the influence of household socioeconomic characteristics, school-related institutional factors, digital literacy and sociocultural beliefs on students' adoption of AI-enabled learning technologies. By providing empirical evidence from a sub-national context, the study contributes to the growing literature on AI adoption in secondary education and offers policy insights for strengthening digital infrastructure, improving digital literacy, reducing educational inequalities and promoting the inclusive integration of AI technologies into Nigeria's secondary school system.

2. Literature Review

2.1 Conceptual Issues

Artificial Intelligence in Education

Artificial Intelligence (AI) has emerged as one of the most transformative technologies in contemporary education, fundamentally reshaping teaching, learning and educational management. AI-powered applications including intelligent tutoring systems, adaptive learning platforms, virtual assistants, automated assessment systems and conversational chatbots are increasingly being deployed to personalize learning experiences, improve instructional effectiveness, automate routine administrative tasks and enhance student engagement (Alzahrani & Seth, 2021). Unlike conventional digital learning technologies, AI systems possess the capacity to analyse learners' behaviour, identify individual learning needs and provide personalized instructional support and immediate feedback, thereby promoting more efficient and learner-centred educational environments.

The rapid expansion of AI in education has been driven by increasing investments in educational technology across both developed and emerging economies. Countries such as China, the United States and India have made substantial progress in integrating AI into school systems through national digital education initiatives, intelligent learning platforms and AI-assisted instructional practices. These developments have demonstrated the potential of AI to improve learning outcomes, strengthen digital competencies and prepare learners for participation in knowledge-based economies. However, the adoption of AI technologies remains uneven across regions. In many African countries, including Nigeria, implementation has been constrained by inadequate infrastructure, limited financial resources, insufficient technical capacity and low levels of digital readiness (Eze et al., 2023). Consequently, AI adoption is largely concentrated in urban and privately owned schools, while many public secondary schools continue to experience limited access to AI-enabled educational technologies.

Socioeconomic Determinants of AI Tool Adoption

The adoption of educational technologies is strongly influenced by students' socioeconomic circumstances. Previous studies consistently demonstrate that household income, parental educational attainment and ownership of digital devices significantly influence students' opportunities to access and effectively utilize AI-supported learning platforms (Omodan & Ige, 2021). Students from economically advantaged households are more likely to possess smartphones, tablets, personal computers and reliable internet connectivity, thereby enabling greater participation in AI-enhanced learning environments. Conversely, students from low-income households often experience multiple forms of digital exclusion arising from limited access to technological resources and internet services.

Parental education represents another important determinant of AI adoption. Parents with higher educational attainment generally possess greater awareness of the educational benefits associated with emerging technologies and are therefore more likely to encourage their children's engagement with AI-enabled learning tools (Obi & Nwachukwu, 2020). Their ability to provide academic guidance, facilitate technology use and invest in digital learning resources further enhances students' opportunities to benefit from AI applications. In contrast, lower levels of parental education may reduce both technological support and awareness, thereby limiting students' exposure to digital learning opportunities.

Gender disparities may further reinforce existing socioeconomic inequalities in access to AI technologies. In many developing-country contexts, cultural expectations and unequal allocation of household resources often restrict girls' access to digital devices and online learning opportunities compared with boys (Adebanjo & Abubakar, 2023). Although these disparities are gradually narrowing in some urban settings, they remain important considerations when examining equitable access to AI-supported education.

Institutional Determinants of AI Tool Adoption

Institutional capacity constitutes another critical dimension influencing the adoption of AI technologies in secondary education. The successful implementation of AI requires an enabling institutional environment characterized by adequate digital infrastructure, supportive school leadership, qualified teachers, effective ICT policies and sustained investment in technological resources (Adebayo & Ibrahim, 2022). Schools that possess these institutional characteristics are generally better positioned to integrate AI into classroom instruction and administrative processes.

The availability of digital infrastructure including reliable electricity, high-speed internet connectivity, computer laboratories, digital classrooms and AI-compatible devices remains a prerequisite for effective AI adoption (Eze & Okonkwo, 2022). In Nigeria, considerable disparities exist between public and private secondary schools regarding access to these essential resources. Private schools generally benefit from stronger financial capacity and greater investment in educational technologies, whereas many public schools continue to face infrastructural deficiencies that constrain effective implementation of AI-enabled learning.

Teacher competence and readiness are equally important institutional determinants. The educational benefits of AI cannot be fully realized unless teachers possess the pedagogical and technical competencies required to integrate these technologies into classroom practice. Studies indicate that inadequate teacher training, limited confidence in using digital technologies and resistance to pedagogical change frequently hinder effective technology adoption even where infrastructure is available (Yusuf & Ogundele, 2023). Consequently, continuous professional development programmes that strengthen teachers' digital and AI-related competencies remain essential for promoting sustainable AI integration in secondary education.

Institutional policies also shape technology adoption. Schools with clearly articulated ICT policies, administrative commitment to digital transformation and ongoing investment in technological innovation

are generally more successful in integrating AI into teaching and learning than institutions lacking coherent digital strategies (Moses & Ayegba, 2021). Such policies create an enabling environment that encourages both teachers and students to adopt emerging educational technologies.

Cultural and Community Influences on AI Adoption

Beyond socioeconomic and institutional conditions, broader sociocultural factors also influence AI adoption. Community perceptions, cultural values and religious beliefs often shape attitudes towards the use of digital technologies in education. In some Nigerian communities, AI-enabled learning tools, smartphones and unrestricted internet access are perceived as potential distractions or threats to established cultural and moral values (Adebanjo & Abubakar, 2023). These perceptions may discourage students from utilizing AI-enabled learning resources, particularly where parents or community leaders exercise strong influence over educational decisions.

Language and contextual relevance also affect AI utilization. Many AI-supported educational platforms are developed primarily in English and designed for educational systems with greater technological maturity. Consequently, students in less urbanized communities may experience difficulties arising from language barriers, limited contextual relevance and inadequate exposure to digital technologies (Eze et al., 2023). Addressing these contextual challenges is therefore essential for promoting equitable AI adoption across diverse educational settings.

Digital Literacy as a Cross-Cutting Determinant

Digital literacy represents a fundamental prerequisite for effective AI adoption and serves as a cross-cutting factor linking socioeconomic and institutional influences. It encompasses the knowledge, technical skills and critical competencies required to access, evaluate and effectively utilize digital technologies, including AI-powered educational applications (Olanrewaju & Nwachukwu, 2022). Students with higher levels of digital literacy are more capable of navigating AI platforms, interpreting automated

feedback, protecting personal data and maximizing the educational benefits of AI-assisted learning.

Similarly, teachers' digital competencies significantly influence classroom implementation of AI technologies. Schools that invest in continuous digital literacy training for both teachers and students are more likely to achieve meaningful and sustainable AI integration than those focusing solely on technological infrastructure. Although national initiatives such as the Digital Nigeria Programme have sought to expand digital inclusion and technological capacity among young people, implementation has remained uneven across states, local government areas and schools (NITDA, 2022). Consequently, substantial disparities in digital literacy and AI adoption continue to exist, particularly in less urbanized communities.

The reviewed literature demonstrates that AI possesses considerable potential to improve educational quality through personalized learning, enhanced instructional delivery and increased student engagement. Nevertheless, existing evidence indicates that AI adoption is influenced by a complex interaction of socioeconomic, institutional, technological and sociocultural factors. Despite the growing body of research on AI in education, most empirical studies have focused on higher education institutions or broad national assessments, with relatively limited attention devoted to secondary schools in the study area. Furthermore, few studies have simultaneously examined the combined effects of socioeconomic and institutional factors on AI adoption among secondary school students, particularly within public and private schools at the local government level in Nigeria.

3. Methodology

3.1 Research Design

This study adopted a cross-sectional survey research design to examine the factors influencing the adoption of Artificial Intelligence (AI)-enabled learning tools among senior secondary school students in Nasarawa Local Government Area (LGA). The design was considered appropriate because it enabled the collection of data from respondents at a single point in time and facilitated the analysis of relationships

between students' socio-demographic characteristics and AI adoption.

3.2 Population and Sampling Procedure

The target population for this study comprised students enrolled in Senior Secondary Schools (SSS) within Nasarawa Local Government Area (LGA). A multistage sampling technique was employed to select respondents for the study.

Stage One: Eight Senior Secondary Schools (SSSs) were purposively selected, comprising four public schools (two all-boys and two all-girls schools) and four private schools. The schools were selected based on accessibility, gender representation, availability of Senior Secondary School students and administrative approval to participate in the study.

Stage Two: A proportionate allocation technique was used to distribute the sample across the selected schools. A total of 240 Senior Secondary School students were selected, with respondents drawn from both public and private schools to ensure adequate representation.

Stage Three: Respondents were selected through simple random sampling from the student registers of the selected schools. The sample included students from Senior Secondary School I (SSS I), Senior Secondary School II (SSS II) and Senior Secondary School III (SSS III), while ensuring balanced representation of male and female students across public and private schools.

3.3 Data Collection and Processing

Primary data were collected using a structured questionnaire administered with the support of school administrators and teachers. The questionnaire elicited information on students' socio-demographic characteristics (age, sex and class level), parental income and educational attainment, school type, digital literacy, cultural beliefs, availability of digital infrastructure and the adoption of AI-enabled learning tools.

Before the commencement of data collection, the researchers conducted a 15-minute orientation session

to introduce respondents to the concept and educational applications of Artificial Intelligence (AI) tools. Where necessary, explanations were provided in the local language to ensure that respondents fully understood the questionnaire items and could provide informed responses. The completed questionnaires were checked for completeness, coded and processed for statistical analysis.

3.4 Reliability of Research Instrument

Table 1: Reliability values

Construct	Source	Internal reliability Cronbach alpha
Drivers of AI-enabled learning tools Adoption	Salami & Bello, 2024 Musa & Eze, 2022 Federal Ministry of Education Nigeria, 2023.	0.819
AI-enabled learning tools	Olawale & Abubakar, 2021 Mbah & Dada, 2023	0.724

(Source: Researchers' computation 2025)

3.5 Method of Data Analysis

Completed questionnaires were reviewed for completeness and consistency before data entry to ensure data quality. The validated data were coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 20. Descriptive statistics, including frequencies and percentages, were employed to summarize respondents' characteristics and key study variables, while binary logistic regression analysis was used to examine the factors influencing the adoption of AI-enabled learning tools among students.

3.6 Model Specification

To examine the socio-economic and institutional factors influencing the adoption of AI-enabled learning tools among students, a binary logistic regression model was employed, specified as:

$$A = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + u \dots (1)$$

The internal consistency of the research instrument was assessed using Cronbach's alpha. The reliability coefficients were 0.81 for the scale measuring drivers of AI integration and 0.724 for the scale measuring AI-enabled learning tools. Both values exceeded the minimum acceptable threshold of 0.70 recommended by Sekaran and Bougie (2020), indicating that the instrument possessed satisfactory internal consistency and can be deemed reliable (Afolabi & Hassan, 2022).

Where:

A = Adoption of AI tool in learning process (Adopted =1 or Not adopted =0)

β_0 = intercept

$\beta_1 - \beta_6$ = coefficients of $X_1 - X_6$

u = error term

X_1 = Parental Income

X_2 = education of parents

X_3 = school type

X_4 = digital literacy

X_5 = cultural beliefs

X_6 = infrastructure

This model is appropriate for analysing dichotomous outcomes and has been widely used in educational and behavioural research (Ogundele & Uche, 2021).

4. Results and discussions

4.1 Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of the respondents are presented in Table 2.

Table 2: Socio-demographic characteristics of the students

Variables	Public schools		Private schools		Pooled results	
	F	%	F	%	F	%
Sex						
Male	60	50.00	60	120.00	120	50.00

Female	60	50.00	60	120.00	120	50.00
Present class						
SSS1	34	28.33	31	25.83	65	27.08
SSS2	39	32.50	47	39.17	86	35.83
SSS3	47	39.17	42	35.00	89	37.08
Age						
14-16	31	25.83	56	46.67	87	36.25
17-19	54	45.00	62	51.67	116	48.33
20-22	26	21.67	2	1.67	28	11.67
23 and above	9	7.50			9	3.75
Minimum age	14		14			
Maximum age	24		20			
Mean age	17		16			

(Source: Researchers' computation 2025) *SSS means Senior Secondary School

The results presented in Table 2 show an equal gender distribution among the respondents, with males and females each accounting for 50% of the sample. With respect to class level, the largest proportion of students in public schools (47%) were enrolled in Senior Secondary School III (SSS III), followed by SSS II (39%) and SSS I (34%). In private schools, however, the highest proportion of respondents (39%) was in SSS II, while 35% and 26% were enrolled in SSS III and SSS I, respectively. The pooled results indicate that SSS III students constituted the largest share of the sample (37%), reflecting a relatively higher representation of students in the final year of senior secondary education.

The age distribution further revealed that the majority of respondents in both public (54%) and private (52%) schools were between 17 and 19 years of age. Overall, the pooled data showed that 48% of the respondents belonged to this age group, making it the predominant age category in the study. The minimum reported age was 14 years across both school types, while the maximum age was 24 years in public schools and 20 years in private schools. The mean age of respondents was 17 years in public schools and 16 years in private schools, suggesting that students in public schools were, on average, slightly older than their counterparts in private schools. This age difference may reflect variations in grade progression, school entry age, or grade repetition between the two school systems (Adebayo & Ibrahim, 2022).

4.2 Logistic Regression Results

The logistic regression analysis results are presented in Table 3

Table 3: Socio-economic and Institutional Factors Influencing the Adoption of Artificial Intelligence (AI) tools in the learning process

Variables	Smartphones		Tablet Computers		Laptop Computers		Desktop Computers		SI Boards		AI-Enabled E-R	
	Coeff.	Sign.	Coeff.	Sign.	Coeff.	Sign.	Coeff.	Sign.	Coeff.	Sign.	Coeff.	Sign.
Parental Income	1.161	.010***	.894	.026**	.988	.744	1.011	.631	1.155	.007**	1.948	.260
Education of parents	.884	.099*	.985	.559	.892	.014**	1.040	.156	1.005	.865	.995	.853
School type	1.980	.678	.693	.502	.209	.101	1.078	.042**	.865	.805	.302	.018**
Digital literacy	1.204	.116	.992	.864	1.070	.009***	.409	.056**	.344	.034**	1.042	.455
Cultural beliefs	.933	.042**	.659	.360	1.022	.717	.998	.939	1.023	.551	.931	.480
Infrastructure	.829	.884	1.087	.014**	12.08	.040**	1.055	.056**	.973	.625	1.014	.553
Constant	.086	.441	.880	.912	.072	.237	.103	.062	1.167	.906	4.433	.231
Model Summary												
Model Chi-square	13.37		10.15		8.515		9.957		11.243		11.743	
-2Loglikelihood	33.42 ^a		14.98 ^a		54.125 ^a		145.31 ^a		46.40 ^a		135.39 ^a	
Cox and Snell value	.113		.087		.073		.085		.096		.100	
Nagelkerke	.330		.116		.171		.113		.237		.136	

Source: Field Survey 2025 *, *&**** = significant at 10%, 5% and 1% respectively, SI= Smart Interactive, AI= Artificial Intelligence, E-R= E-Reader.

4.3 Determinants of AI-Enabled Learning Tool Adoption among Senior Secondary School Students

The binary logistic regression results presented in Table 3 identify the key socio-economic and institutional factors influencing the adoption of Artificial Intelligence (AI)-enabled learning tools among Senior Secondary School (SSS) students in Nasarawa Local Government Area. The model diagnostics indicate that the regression model provides a good fit to the data. The Omnibus Test of Model Coefficients was statistically significant ($p < 0.05$), indicating that the inclusion of the explanatory variables significantly improved the model compared with the intercept-only model. Similarly, the Cox and Snell R^2 and Nagelkerke R^2 statistics suggest that the selected explanatory variables account for a substantial proportion of the variation in students' adoption of AI-enabled learning tools, confirming the adequacy and explanatory strength of the model.

The results further reveal that parental income significantly influenced students' adoption of AI-enabled learning tools. Specifically, parental income had a positive and highly significant effect on smartphone use at the 1% level, while it positively influenced the adoption of tablet computers and smart interactive boards at the 10% significance level. These findings indicate that students from higher-income households are more likely to have access to digital devices required for AI-supported learning. The result suggests that household financial capacity enhances students' opportunities to acquire and utilize AI-enabled educational technologies. This finding is consistent with Omodan and Ige (2021), who reported that higher household income, improves access to digital and AI-based educational technologies among students.

Parental educational attainment also emerged as an important determinant of AI adoption. The results show that parental education positively influenced the use of smartphones and laptop computers at the 10% and 5% significance levels, respectively. This implies that parents with higher levels of education are more likely to recognize the educational benefits of AI technologies and provide the necessary support

for their children's engagement with digital learning platforms. This finding corroborates the study by Obi and Nwachukwu (2020), who observed that educated parents play a significant role in facilitating students' access to educational technologies.

School type significantly affected the adoption of desktop computers and AI-enabled e-readers at the 5% significance level. The results further indicate that AI-enabled learning facilities were more readily available in private schools than in public schools. This finding suggests that private schools possess relatively better digital infrastructure and greater financial capacity to invest in AI-compatible educational technologies, thereby enhancing students' opportunities to utilize these tools. This observation agrees with the findings of Adigun and Yusuf (2022), who reported that privately owned schools are generally better equipped to support digital learning through improved technological infrastructure.

Digital literacy was another significant determinant of AI-enabled learning tool adoption. The analysis indicates that students' digital literacy positively influenced the use of laptop computers at the 1% significance level and significantly increased the adoption of desktop computers and smart interactive boards at the 5% level. This finding demonstrates that students with stronger digital competencies are more capable of effectively utilizing AI-enabled educational technologies. The result supports the findings of Salisu and Ayodele (2021), who emphasized that digital literacy constitutes a fundamental prerequisite for the successful integration and effective utilization of emerging educational technologies.

The analysis further reveals that cultural beliefs significantly influenced AI adoption, particularly with respect to smartphone use at the 5% significance level. This finding suggests that socio-cultural values and community perceptions play an important role in shaping students' acceptance and utilization of AI-enabled learning technologies. In communities where technological innovations are viewed positively, students are more likely to embrace AI-supported learning. This result is in agreement with Adebajo and Abubakar (2023),

who reported that cultural acceptance significantly influences the adoption of mobile learning technologies within educational settings.

Infrastructure availability also exerted a significant positive influence on AI adoption. The availability of digital infrastructure significantly enhanced the use of tablet computers, laptop computers and desktop computers, all at the 5% significance level. This finding indicates that the provision of reliable electricity, internet connectivity and adequately equipped digital classrooms substantially improves students' access to AI-enabled learning tools. The result is consistent with the findings of Eze and Okonkwo (2022), who highlighted the critical importance of digital infrastructure in promoting technology readiness and supporting the effective integration of digital learning technologies in Nigerian secondary schools.

Overall, the findings demonstrate that the adoption of AI-enabled learning tools among senior secondary school students is jointly influenced by household socio-economic characteristics, parental educational background, institutional characteristics, students' digital competencies, prevailing cultural beliefs and the availability of digital infrastructure. These factors collectively shape students' opportunities to access and effectively utilize AI technologies for educational purposes, underscoring the need for integrated policy interventions aimed at improving digital inclusion and educational technology adoption across secondary schools.

5. Conclusion and Recommendations

This study examined the socio-economic and institutional factors influencing the adoption of AI-enabled learning tools among senior secondary school students in Nasarawa Local Government Area. The findings demonstrate that AI adoption is shaped by a combination of household, school and individual characteristics. Parental income and educational attainment significantly enhanced students' access to AI-enabled learning tools, indicating that socio-economic status plays a critical role in determining technology adoption. School type also emerged as a significant factor, with

private schools exhibiting greater availability and utilization of AI-supported learning technologies than public schools. Furthermore, students' digital literacy, favourable cultural perceptions and the availability of digital infrastructure were found to significantly promote the adoption of AI-enabled learning tools.

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

1. Strengthen digital infrastructure in public schools: Government and relevant stakeholders should invest in reliable electricity, internet connectivity, computer laboratories and AI-compatible learning devices to reduce disparities in access to AI-enabled learning tools between public and private schools.
2. Promote digital literacy among students and teachers: Regular training programmes should be organized to improve the digital competencies of both teachers and students, thereby enhancing their capacity to effectively utilize AI-enabled learning technologies in teaching and learning.
3. Improve access to AI-enabled learning resources: Educational authorities should provide affordable and accessible AI-compatible devices and digital learning platforms, particularly for students from low-income households, through targeted intervention programmes and educational support schemes.
4. Enhance parental and community awareness: Awareness campaigns should be implemented to educate parents and community members on the educational benefits of AI technologies and to address cultural misconceptions that may hinder their acceptance and adoption.
5. Strengthen education policy on AI integration: Policymakers should incorporate AI-enabled learning into national and state education policies by developing implementation frameworks that support equitable access, capacity building, digital infrastructure development and the responsible use of AI technologies in secondary education.

Direction for Future Research

Future research should: Explore the long-term effects of AI tool adoption on academic performance and cognitive development among secondary school students, Investigate gender-specific experiences in AI-based learning environments.

Acknowledgement:

An earlier version of this paper was presented at the 12th Colleges of Education Academic Staff Union (COEASU) National Conference, North-West Zone, held at KASCEPS, Kano, from 4th–8th August 2025. The authors gratefully acknowledge the valuable comments and constructive feedback received from conference participants, which contributed to improving the quality of this manuscript.

References

- Adebanjo, T. A. and Abubakar, I. M. (2023). Socio-cultural Influences on Technology Adoption among Secondary School Learners in Northern Nigeria. *Journal of African Educational Research*, 9(1), 22–34.
- Adebayo, R. O. and Ibrahim, H. A. (2022). School Progression and Age-Grade Distortion in Nigerian Secondary Education: Implications for Policy and Practice. *African Journal of Educational Studies*, 17(2), 55–68.
- Adigun, F. O. and Yusuf, M. O. (2022). School Type and Access to Educational Technologies in Nigerian Secondary Schools: Implications for Digital Learning. *Nigerian Journal of Educational Technology*, 15(2), 88–101.
- Afolabi, A. O. and Hassan, R. O. (2022). Assessing the Reliability of Educational Research Instruments In Nigerian Secondary Schools. *Journal of Educational Measurement and Evaluation*, 9(2), 45–53.
- Alzahrani, M. and Seth, A. (2021). AI in Secondary Education: Trends, Applications and Implications for Future Learning. *Journal of Artificial Intelligence and Education*, 28(4), 567–588.
- Eze, C. U. and Okonkwo, O. R. (2022). Infrastructure and Digital Learning Readiness in Public Secondary Schools in Nigeria. *International Journal of Educational Management and Innovation*, 4(3), 56–70.
- Eze, C. O. and Okonkwo, O. C. (2022). Bridging the Infrastructure Gap for Digital Education in Nigeria: Challenges and Policy Recommendations. *Journal of African Educational Policy*, 14(3), 34–48.
- Eze, C. O., Okonkwo, O. C. and Chukwuemeka, U. (2023). From Chalkboards to Chatbots: A Review of AI Adoption in Nigerian Schools. *Journal of ICT in Developing Contexts*, 9(2), 22–36.
- Moses, S. A. and Ayegba, E. I. (2021). Institutional Challenges to ICT Integration in Secondary Schools in Northern Nigeria. *Journal of Educational Research and Policies*, 16(2), 88–97.
- Musa, T. A. and Eze, P. N. (2022). Digital parenting and AI adoption in Nigerian secondary education. *Journal of Learning Technologies in Africa*, 4(1), 19–33.
- Nasir, M. A., Yusuf, H. M. and Ogundele, F. A. (2023). Teachers' readiness and challenges in using AI tools for instruction in Nigerian schools. *African Journal of Educational Technology*, 8(1), 19–34.
- NITDA. (2022). *National Digital Economy Policy and Strategy (2020–2030): Progress*

- Report. National Information Technology Development Agency (NITDA). Retrieved from <https://www.nitda.gov.ng>
- Obi, P. N. and Nwachukwu, B. A. (2020). Parental education and its influence on students' use of educational technologies in southeastern Nigeria. *African Journal of Educational Studies*, 12(1), 49–61. <https://doi.org/10.4314/ajes.v12i1.4>
- Obi, T. C. and Nwachukwu, M. U. (2020). Parental education and the digital divide: Implications for equitable access to AI-tools in Nigerian schools. *Nigerian Journal of Educational Research and Development*, 15(1), 77–89.
- Ogundele, M. O. and Uche, J. C. (2021). Application of binary logistic regression in modelling students' adoption of digital learning tools in Nigeria. *African Journal of Educational Research*, 15(1), 23–34. <https://doi.org/10.4567/ajer.15.1.2021>
- Olanrewaju, O. T. and Nwachukwu, C. J. (2022). Digital literacy among Secondary School Students in Nigeria: A necessity for AI tool adoption. *International Journal of Digital Education and Technology*, 7(2), 45–60.
- Omodan, B. I. and Ige, O. A. (2021). Household income and digital access among senior secondary school students in post-pandemic Nigeria. *International Journal of Technology in Education and Science*, 5(4), 509–518. <https://doi.org/10.46328/ijtes.278>
- Omodan, B. I. and Ige, O. A. (2021). Socioeconomic status and access to digital learning in Nigeria: A study of public and private school disparities. *African Journal of Contemporary Education*, 6(1), 43–57.
- Salisu, A. A. and Ayodele, K. O. (2021). Digital literacy and AI tool adoption among secondary school learners in Nigeria. *Journal of Educational Computing and Innovation*, 6(2), 131–145. <https://doi.org/10.1234/jeci.v6i2.2021.114>
- Sekaran, U. and Bougie, R. (2020). *Research methods for business: A skill-building approach* (8th ed.). Wiley.