SOCIOLOGICAL AND ETHICAL IMPLICATIONS OF ARTIFICIAL INTELLIGENCE ADOPTION FOR TEACHING AND LEARNING IN SECONDARY SCHOOLS IN CALABAR MUNICIPALITY, CROSS RIVER STATE

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Abstract

This study accessed the sociological a well as ethical implications of Artificial Intelligence (AI) adoption in teaching and learning within secondary schools in Calabar, with teaching and learning as the dependent variable. Artificial Intelligence adoption was conceptualized using two dimensions: sociological implications and ethical implications of AI usage in secondary school education. The study adopted a descriptive survey research design. The population of 1,213 public senior secondary school students was considered appropriate for this study because these students are among the most active users of digital technologies and Artificial Intelligence tools for academic purposes. Senior secondary school students are also more likely to have sufficient exposure to teaching and learning activities that involve AI-assisted educational resources, making them suitable respondents for the study. Furthermore, focusing on public secondary school students in Calabar Municipality provides relevant data for understanding the sociological and ethical implications of Artificial Intelligence adoption within the local educational context.. A sample of 201 students was selected using the simple random sampling technique. Data were collected using a structured questionnaire titled "Artificial Intelligence Adoption and Teaching and Learning Questionnaire (AIATLQ)." The instrument was validated by experts in Educational Technology and Measurement and Evaluation, while its reliability was established using the Cronbach Alpha reliability method. Pearson Product Moment Correlation analysis was used to test the hypotheses at the 0.05 level of significance. The findings of the study revealed that sociological implications and ethical implications of Artificial Intelligence adoption significantly influence teaching and learning in secondary schools in Calabar Municipality, Cross River State. Based on the

findings, it was recommended, among others, that schools should regulate and guide the use of Artificial Intelligence tools in classrooms, promote ethical awareness among students and teachers, and ensure equitable access to AI-supported learning resources to enhance effective teaching and learning.

Keywords: Artificial Intelligence, Sociological Implications, Ethical Implications, Teaching and Learning, Secondary School Students

Introduction

The emergence of Artificial Intelligence (AI) has become one of the most influential technological developments shaping contemporary education systems globally. It refers to computer-based systems capable of performing human-like tasks such as reasoning, learning, problem-solving, and decision-making. In education, AI tools such as ChatGPT, Google Gemini, Microsoft Copilot, and other adaptive learning platforms are increasingly being integrated into classroom instruction and student learning activities. These developments are reshaping how teaching and learning are designed, delivered, and experienced across different levels of education (UNESCO, 2023; Kasneci et al., 2023).

Artificial Intelligence is now a very important component of modern educational practice, offering new possibilities for improving teaching effectiveness and student learning experiences. Its integration into secondary school education has enabled more personalized instruction, where learning materials can be adapted to meet individual student needs. Studies have shown that AI-based educational systems can improve students' academic engagement by providing timely feedback and tailored support during learning activities (Zawacki-Richter et al., 2019). Teachers are also benefiting from AI tools that assist in lesson planning, assessment, and classroom management, thereby improving instructional efficiency (Chen, Chen, & Lin, 2020). Despite these advantages, there are concerns that excessive reliance on AI may weaken students' critical thinking and reduce meaningful interaction in the classroom environment. Educational researchers argue that the success of AI in education depends largely on how it is balanced with human teaching practices and ethical considerations (Selwyn, 2019; Antai et. al 2025; Agbade et. al, 2019; Bessong et. al 2025; Patrick et. al 2026; Usua et. al 2023). Furthermore, disparities in access to digital technologies continue to create inequalities in how students benefit from AI-driven learning opportunities. Consequently, careful integration and regulation of Artificial Intelligence in secondary education are necessary to ensure that it enhances rather than undermines teaching and learning outcomes.

The presence of AI in our secondary school is becoming more visible through digital classrooms, online learning platforms, and mobile-based educational applications. Teachers now use AI-supported systems for lesson planning, content generation, assessment, and feedback delivery, while students rely on these tools for homework support, research assistance, and personalized learning experiences. Holmes, Bialik, and Fadel (2019) observed that AI has the potential to improve education by enabling more personalized learning pathways and supporting efficient instructional delivery. Likewise, Luckin et al. (2016), Effiong & Agbade (2018) and Ogunode et. al (2024) emphasized that AI can enhance learning by providing adaptive systems that respond to individual learner needs and promote continuous engagement.

However, alongside these educational benefits, the integration of Artificial Intelligence into schooling systems has raised important sociological and ethical concerns. Sociologically, AI is reshaping interaction patterns within schools by influencing teacher–student relationships, peer collaboration, classroom communication, and access to learning

opportunities. Ethically, concerns have emerged regarding academic integrity, privacy of student data, fairness in AI-generated outputs, and the risk of overdependence on technology. UNESCO (2023) cautioned that while AI can enhance learning, it must be implemented responsibly to avoid deepening inequalities and ethical risks in education systems.

Looking at this in sociological lens, AI adoption in education does not only affect academic delivery but also alters the social environment of the school. While it may promote collaboration through digital learning tools, it can also reduce face-to-face interaction and weaken traditional classroom relationships if not properly managed. It may further widen the gap between students with strong access to digital tools and those with limited access, thereby creating inequality in learning experiences. Holmes et al. (2019) and Adie et. al (2019) noted that without careful integration, AI systems may unintentionally disrupt social learning structures within schools.

Ethically, Artificial Intelligence raises serious questions about how students use technology in academic work. One major concern is academic dishonesty, where students may depend on AI-generated responses without developing independent understanding. There are also concerns about data privacy, algorithmic bias, and transparency in automated learning systems (Olofu, & Hur-Yagba, 2019). Cotton, Cotton, and Shipway (2023) argued that uncontrolled use of generative AI tools in education may encourage plagiarism and weaken students' critical thinking and originality. Similarly, UNESCO (2023) emphasized the need for ethical guidelines to ensure that AI use in education remains transparent, fair, and accountable.

Within Nigeria, particularly in urban educational settings, exposure to Artificial Intelligence is gradually increasing as students gain access to smartphones, internet services, and digital learning tools. Secondary school students in Calabar are increasingly interacting with AI-powered applications for academic purposes (Adie et. al 2019; Olofu & Patrick, 2019; Opara et. al 2020; Agbade et. al, 2019; 2022; Meremikwu et. al 2022). However, the level of awareness and ethical understanding of these technologies varies widely among learners and educators. This uneven exposure raises concerns about whether AI is enhancing meaningful learning or introducing new sociological and ethical challenges in school environments.

Teaching and learning remain the central functions of the education system, and any innovation that influences them deserves careful examination. Effective teaching and learning depend not only on access to technology but also on how such tools shape human interaction, ethical behaviour, and cognitive engagement (Agbor et. al 2026; Effiong & Agbade, 2016; Agbade et. al, 2019; Olofu et. al 2024). Schunk and Greene (2018) emphasized that meaningful learning occurs when students are actively engaged in self-regulated and well-supported learning environments, rather than passive dependence on external assistance.

Despite the rapid growth of Artificial Intelligence in education, empirical studies examining its sociological and ethical implications in secondary schools remain limited, particularly in Cross River State. Much of the existing literature has focused on higher education contexts or general academic performance, with less attention given to how AI adoption affects social relationships, ethical behaviour, and classroom learning dynamics at the secondary school level.

It is against this background that this study seeks to examine the sociological and ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools in Calabar Municipality, Cross River State.

Statement of the problem

There is a growing concern that the rapid integration of Artificial Intelligence (AI) into education may be influencing how secondary school students engage in teaching and learning

activities in Calabar Municipality, Cross River State. In recent times, AI applications such as chatbots, automated writing assistants, and problem-solving platforms have become easily accessible to students through smartphones, computers, and internet-enabled devices. While these tools are intended to enhance learning experiences and improve academic performance, there is uncertainty about how their widespread use is affecting classroom interaction, learning behaviour, and students' overall academic development.

In numerous secondary schools within the study area, students are increasingly exposed to Artificial Intelligence technologies both inside and outside the classroom, utilizing these tools to understand complex concepts, generate academic responses, conduct research, and complete learning tasks. Although these applications can enhance access to information and support learning, concerns are emerging that such practices may reduce students' critical thinking ability, classroom engagement, and commitment to independent learning, students are increasingly exposed to Artificial Intelligence technologies both inside and outside the classroom (Adie et. al, 2020). Some students use these tools to understand complex concepts, generate academic responses, and complete assignments with minimal teacher guidance. Although this may improve speed and access to information, concerns are emerging that such practices may reduce students' critical thinking ability, classroom engagement, and commitment to independent learning. There is also growing apprehension that overreliance on AI tools may weaken the traditional teacher–student relationship and reduce meaningful peer collaboration within the learning environment.

Furthermore, differences in students' exposure to and understanding of Artificial Intelligence may result in varying sociological and ethical outcomes in the school system. While some students may use AI responsibly to support learning, others may engage in unethical practices such as plagiarism, overdependence on AI-generated answers, or misuse of digital tools for academic tasks. These patterns raise important ethical concerns regarding academic integrity, fairness in assessment, and responsible use of technology in education (UNESCO, 2023; Olofu & Ugbe, 2021; Patrick et. al 2025; Agbade et. al, 2020; Cotton, Cotton, & Shipway, 2023).

Despite the increasing presence of Artificial Intelligence in education, there is limited empirical evidence on its sociological and ethical implications in secondary schools in Calabar Municipality, Cross River State. In particular, little is known about how AI adoption influences social interaction patterns within the school environment and how ethical issues related to its use affect teaching and learning processes. Most existing studies have focused on general educational outcomes or higher education contexts, with limited attention given to secondary school settings in Nigeria. This creates a gap in knowledge that this study seeks to address.

This therefore study seeks to examine the sociological and ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools in Calabar Municipality, Cross River State.

Research Objectives

This study focuses on the sociological and ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools in Calabar Municipality, Cross River State. Specifically, the study is guided by the following objectives:

1. To examine the sociological implications of Artificial Intelligence adoption on teaching and learning in secondary schools in Calabar.
2. To investigate the ethical implications of Artificial Intelligence adoption on teaching and learning in secondary schools in Calabar Municipality, Cross River State.

Research Questions

1. What are the sociological implications of Artificial Intelligence adoption on teaching and learning in secondary schools in Calabar Municipality, Cross River State?
2. What are the ethical implications of Artificial Intelligence adoption on teaching and learning in secondary schools in Calabar Municipality, Cross River State?

Research Hypotheses

1 There is no significant relationship between sociological implications of Artificial Intelligence adoption and teaching and learning in secondary schools in Calabar Municipality, Cross River State.

2 There is no significant relationship between ethical implications of Artificial Intelligence adoption and teaching and learning in secondary schools in Calabar Municipality, Cross River State.

Methodology

The study adopted a descriptive survey research design. This design was considered appropriate because it enables the researcher to collect data from a large population and describe the existing situation as it relates to the sociological and ethical implications of Artificial Intelligence adoption in teaching and learning among secondary school students in Calabar Municipality, Cross River State.

The study was carried out among public secondary school students in Calabar Municipality, Cross River State. The population of the study comprised 1,213 senior secondary school students drawn from selected public secondary schools within the area. These schools include major government-owned secondary schools within the municipality, which were considered suitable for the study because they provide a realistic representation of students' exposure to Artificial Intelligence tools in teaching and learning processes.

A sample of 201 students was selected from four public secondary schools in Calabar Municipality, Cross River State, using the simple random sampling technique. The schools included Government Secondary School, Federal Government Girls' College, Government Technical College, and West African Peoples Institute (WAPI) Secondary School. The sample was proportionately distributed among the selected schools based on their student population to ensure adequate representation. Thereafter, class registers were obtained from each school, and students were selected through a simple random sampling procedure using the balloting method, whereby each student was assigned a number and given an equal chance of being selected. This procedure ensured fairness in the selection process, minimized sampling bias, and enhanced the representativeness of the sample. The selected schools were chosen because they are among the major public secondary schools in Calabar Municipality and have sizeable student populations that adequately reflect the characteristics of senior secondary school students within the study area. Data for the study were collected using a structured questionnaire titled "Artificial Intelligence Adoption and Teaching and Learning Questionnaire (AIATLQ)". The instrument was divided into sections. Section A contained demographic information of respondents such as name of school and gender. Section B contained items measuring the sociological implications of Artificial Intelligence adoption in teaching and learning, while Section C contained items measuring the ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools. The instrument was structured on a four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The instrument was subjected to face and content validation by three experts in Educational Measurement and Evaluation to ensure clarity, relevance, and appropriateness for the study objectives. Their corrections and suggestions were incorporated into the final draft of the instrument before administration.

To determine the reliability of the instrument, a pilot study was conducted using 30 senior secondary school students from a neighbouring Local Government Area who were not

part of the main study. The data obtained from the pilot test were analyzed using Cronbach Alpha reliability technique. A reliability coefficient of 0.84 was obtained, indicating that the instrument was reliable for the study. The data collected were analyzed using the Pearson Product Moment Correlation Coefficient to test the two hypotheses formulated for the study at 0.05 level of significance.

Results

This section presents the results of the data analysis conducted to test the hypotheses formulated for the study on the sociological and ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools in Calabar Municipality, Cross River State

Hypothesis 1: There is no significant relationship between sociological implications of Artificial Intelligence adoption and teaching and learning in secondary schools in Calabar Municipality, Cross River State. In this hypothesis, sociological implications of Artificial Intelligence adoption was considered as the independent variable, while teaching and learning was the dependent variable. Both variables were measured on a continuous scale. To test the hypothesis, Pearson Product Moment Correlation analysis was employed and the results are presented in Table 1.

Table 1: Pearson Product Moment Correlation analysis of the relationship between sociological implications of Artificial Intelligence adoption and teaching and learning (n = 201)

Variable	Mean	SD	r	p-value	Effect size (r^2)
Sociological Implications of AI Adoption (X)	25.12	4.21			
			0.29*	**0.003**	**0.0841**
Teaching and Learning (Y)	28.34	4.67			

*Significant at $p < .05$; df = 199

The entries in table 1 show the means and standard deviations of the variables of the study. The result reveals a statistically significant low positive correlation coefficient (r = 0.29) at 0.05 alpha level with 199 degrees of freedom. This indicates that sociological implications of Artificial Intelligence adoption have a positive relationship with teaching and learning in secondary schools in Calabar Municipality, Cross River State. Therefore, the null hypothesis was rejected. This implies that sociological implications of Artificial Intelligence adoption significantly influence teaching and learning among secondary school students in the study area.

Furthermore, the effect size ($r^2 = 0.0841$) indicates that approximately 8.4% of the variance in teaching and learning is explained by sociological implications of Artificial Intelligence adoption. This represents a small to moderate effect size, suggesting that other factors also contribute to teaching and learning outcomes.

Hypothesis 2: There is no significant relationship between ethical implications of Artificial Intelligence adoption and teaching and learning in secondary schools in Calabar Municipality, Cross River State.

In this hypothesis, ethical implications of Artificial Intelligence adoption was considered as the independent variable, while teaching and learning was the dependent variable. Both variables were measured on a continuous scale. To test the hypothesis, Pearson Product Moment Correlation analysis was employed and the results are presented in Table 2.

Table 2: Pearson Product Moment Correlation analysis of the relationship between ethical implications of Artificial Intelligence adoption and teaching and learning (n = 201)

Variable	Mean	SD	r	p-value	Effect size (r^2)
Ethical Implications of AI Adoption (X)	24.68	4.33			
			-0.26*	0.005	0.0676
Teaching and Learning (Y)	28.34	4.67			

*Significant at $p < .05$; df = 199

The results in table 2 show the means and standard deviations of the variables of the study. The result reveals a statistically significant low negative correlation coefficient (r = -0.26) at 0.05 alpha level with 199 degrees of freedom. This indicates that ethical implications of Artificial Intelligence adoption have an inverse relationship with teaching and learning in secondary schools in Calabar Municipality, Cross River State. Therefore, the null hypothesis was rejected. This implies that ethical implications of Artificial Intelligence adoption significantly influence teaching and learning among secondary school students in the study area.

Furthermore, the effect size ($r^2 = 0.0676$) shows that approximately 6.8% of the variance in teaching and learning is explained by ethical implications of Artificial Intelligence adoption. This indicates a small effect size, suggesting that other variables also contribute to teaching and learning outcomes.

Discussion of findings

The first hypothesis revealed that sociological implications of Artificial Intelligence adoption have a significant positive relationship with teaching and learning in secondary schools in Calabar Municipality, Cross River State. This finding implies that when Artificial Intelligence is socially integrated into the school system in ways that enhance interaction, collaboration, access to learning resources, and classroom engagement, teaching and learning outcomes are improved.

This result suggests that AI plays a supportive sociological role in the school environment by strengthening communication between teachers and students and encouraging collaborative learning among peers. It also indicates that AI-supported learning environments may make classroom instruction more interactive and engaging, thereby improving students' participation in learning activities. This finding is in line with Holmes, Bialik, and Fadel (2019), who noted that Artificial Intelligence can enhance education by supporting personalized learning and improving instructional efficiency. It also supports UNESCO (2023), which emphasized that AI has the potential to improve educational experiences when responsibly integrated into learning systems. Similarly, Luckin et al. (2016), Olofu et. al (2024) and Ushie et. al (2023) argued that intelligent tutoring systems can promote learner engagement by providing individualized academic support that strengthens understanding and participation. Therefore, the positive relationship observed in this study suggests that sociological dimensions of AI adoption, such as improved interaction, access to digital learning support, and enhanced classroom engagement, play an important role in improving teaching and learning outcomes.

The second hypothesis revealed that ethical implications of Artificial Intelligence adoption have a significant negative relationship with teaching and learning in secondary schools in Calabar Municipality, Cross River State. This finding indicates that as ethical

concerns associated with AI use increase, teaching and learning outcomes tend to decline. This result implies that unethical practices such as plagiarism, overdependence on AI-generated answers, misuse of AI tools for assignments, and reduced academic honesty negatively affect the teaching and learning process. While AI tools can support learning by providing quick explanations and academic assistance, their misuse may reduce students' critical thinking skills, originality, and active engagement in academic work. This finding aligns with Cotton, Cotton, and Shipway (2023), who warned that excessive reliance on generative AI tools such as ChatGPT may encourage academic dishonesty and weaken students' independent thinking abilities ((Akeh et. al 2026; Inyang et. al 2022; Igyu et. al, Obi et. al 2020; Adie et. al, 2026). It also supports Kasneci et al. (2023), who observed that although AI can improve learning efficiency, uncontrolled use may reduce cognitive engagement and problem-solving skills. Furthermore, Dwivedi et al. (2023), Olowonefa & Agbade (2023) and Agbade et. al (2021) emphasized that the use of AI in education must be properly regulated to prevent overdependence and ethical misuse that could undermine learning quality. UNESCO (2023) also stressed the need for ethical frameworks to guide AI use in education in order to ensure fairness, transparency, and academic integrity.

Conclusion

This study highlights the significant sociological and ethical implications of Artificial Intelligence adoption in teaching and learning in secondary schools in Calabar Municipality, Cross River State. The findings revealed that the sociological implications of Artificial Intelligence adoption positively influence teaching and learning, as improved interaction, collaboration, and access to learning resources enhance instructional effectiveness. On the other hand, the ethical implications of Artificial Intelligence adoption were found to have a negative influence on teaching and learning, suggesting that issues such as academic dishonesty, overdependence on AI tools, and misuse of technology can undermine effective learning outcomes. Therefore, it is not merely the adoption of Artificial Intelligence that determines its impact, but the way it is socially integrated and ethically regulated within the school environment.

Recommendations

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

1. School administrators, teachers, and education stakeholders should intensify efforts to create awareness among secondary school students on the sociological benefits and ethical risks associated with Artificial Intelligence tools. This will help students use AI responsibly while improving teaching and learning outcomes.
2. Teachers and school guidance counsellors should provide continuous supervision and ethical guidance on the use of Artificial Intelligence in academic activities. Students should be encouraged to use AI tools as supportive learning aids rather than substitutes for independent thinking, so as to strengthen meaningful engagement in teaching and learning processes.

References

Adie, EB Obi, JJ Okri, JA Ogbe, A O. (2020). Effects of constructivist method of teaching basic science and mathematics on the academic performance of junior secondary students' in Calabar municipality, Cross River State. *Interdisciplinary Journal of Science Education* (IJ-SED) 2 (1), 1-9.

Adie, EB. & Anditung, P. A. (2019). Students' variables and their academic achievement in Technical Colleges in Mathematics in Ogoja Education Zone, Cross River State. *Interdisciplinary Journal of Science Education*, 1(1), 71-78.

Adie, EB; Okri, JA & Anditung, PA (2019). Influence of school science facilities on senior secondary students' learning outcome in Mathematics in Central Education Zone, Cross River State, Nigeria. *Multidisciplinary Journal of Research and Development Perspectives*, 8 (2), 31-38.

Adie, EB, Ntah, HE & Anditung, PA (2026). Qualitative study on the application of mathematical principles in architectural design in Nigeria. *Zamfara International Journal of Education*, 6(1), 143-149.

Agbade, OP, Ihekoronye, E.O. & Opara, J.C (2019). Accounting information system as a veritable tool for enhancing effective financial management in the university system in Nigeria. *Academic Journal of Research and Development.* 11(1), 12-18.

Agbade, OP, Opara, J.C. & Ihekoronye, E.O. (2019). Promoting prudent financial management in secondary schools in the Federal Capital Territory, Abuja: The perspective of internal audit. *Academic Journal of Research and Development*. 11(2), 1-9.

Agbade, OP & Hur-Yagba, C.N. (2020). Effective classroom management: A critical and fundamental task for beginning secondary school teachers in Nigeria. *International Journal of Educational Benchmark*. 18(2), 152-159.

Agbade, OP & Adeyeye, OT (2021). Global and national perspective to the historical development and legal frameworks of Nigerian homegrown school feeding programme. *African Journal of Educational Assessors*. 8(2): 158-163.

Agbade, OP & Ukpanukpong Fidelis Ashibekong (2022). Pragmatic approach to teaching the adult learner in the 21st century in Nigeria: The dimension of guided discovery instructional strategy (GDIS). *Benue State University Journal of Educational Management* (BSUJEM). 3(2): 9-16.

Agbor, C., Opeh, P., Monity, F., Ushie, U, Obo, A., Uquetan, U., Samson, O. & Out, C. (2026). Integrating environmental education and economic literacy for sustainable coastal ecosystem management in Cross River State, Nigeria. Egyptian Journal of Aquatic Biology and Fishers, 31(1), 2591-2602.

Antai, G.O., Ndion, C.O., Betiang, P.A., Olofu, P.A. & Basake, J.A. (2025). Examination of the historical development of human rights from the traditional African perspective. Jurnal Perpajakan dan Keuangan Publik, 4(2), 68-91.

Bessong, BE, Atah, CA, Olom, PA, Akeke, M.NA., Erim, CM, Udie, EA, Emogor, EE, Udida, FU, Azu, SB, Patrick, EO, Olofu, PA, Amakaino, JD, Mbum, UT, Olajide, IO, Dijeh, AE, Agbogo, RA, Anipi, GE, Wonah, FA, Ugiebeme, AA, Ohobu, IM, Ogbiji, MO & Anglioshuye, A. (2025). Leveraging artificial intelligence to enhance inclusive teaching for students with intellectual disabilities in Nigerian universities. *Journal of Intellectual Disabilities-Diagnosis and Treatment*, 13(4), 388-401.

Chen, L., Chen, P., & Lin, Z. (2020). Artificial intelligence in education: A review. *IEEE Access*, *8*, 75264–75278. https://doi.org/10.1109/ACCESS.2020.2988510

Cotton, D. R. E., Cotton, P. A., & Shipway, J. R. (2023). *Chatting and cheating: Ensuring academic integrity in the era of ChatGPT*. Innovations in Education and Teaching International, 60(6), 1–12. https://doi.org/10.1080/14703297.2023.2190148

Effiong, L. V. & Agbade, OP (2018). Principals' perspective on effective planning for revitalizing the standard of secondary school education in Northern Cross River State, Nigeria. *Abuja International Journal of Education and Management Sciences.* 5(1): 180-190.

Effiong, L. V. & Agbade, O.P. (2016). Relationship between teachers' induction and brain-drain in the teaching profession in Abuja Municipal Area Council. *Abuja International Journal of Education and Management Sciences* (ABIJEMS). 4 (1): 122-128.

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., … Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences, 103*, 102274. https://doi.org/10.1016/j.lindif.2023.102274.

Igyu, CO, Adie, EB, Ogah, HA & Anditung PA (2022). Interactive effect of variation teaching strategy in the algebraic motivation, understanding and performance in basic 5 in Benue State, Nigeria. *Vunoklang Multidisciplinary Journal of Science and Technology,* 10(2), 65-71).

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence unleashed: An argument for AI in education*. Pearson Education.

Meremikwu, AN, Benimpuye, AE, Idoko, LI, Arikpo OJ &Tawo, CN (2022). Classroom routine activities as predictors of students' academic achievement in mathematics in Calabar Metropolis of Cross River State, Nigeria. Inter-disciplinary Journal of Science Education, 4(1), 60-70.

Obi., JJ, Adie EB & Okri, JA (2020). Application of 21st century skills in science and mathematics education in Nigeria. *Education for Today,* 16(1), 200-206.

Ogunode, NJ, Edinoh, K. & Olofu PA (2024). Political interference and tertiary institutions in Nigeria. *Indonesian Journal of Social Development*, 1(3), 1-9.

Olofu, PA & Hur-Yagba, C. N. (2019). Availability of functional and sustainable guidance and counselling services for effective service delivery in public secondary schools in Gwagwalada Area Council, Abuja. *Academic Journal of Research and Development*. 12(1), 94-102.

Olofu, PA & Patrick, EO (2019). Teenage pregnancy: Implications for education of the girl child in the 21st century in Nigeria. *International Journal of Continuing Education and Development Studies* (IJCEDE), 5 (1):164-176.

Olofu, PA & Ugbe, TB (2021). Promoting the practice of social distancing in Nigerian tertiary institutions during COVID-19 era: A fundamental public health measure for containing the pandemic on campus. *Journal of Educational Realities,* 11(1): 55-64.

Olofu, PA, Bessong, C.D. & Usua, OB. (2024). Homegrown school feeding programme and basic school students' enrolment and retention rate in Cross River State, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED), 5(1), 80-89.*

Olofu, PA, Bessong DC & Victor, FBR (2024). Stimulating effective administration of higher education in Nigeria through Strategic Planning Approach (SPA). *Interdisciplinary Journal of Science Education (IJ-SED), 5(2), 1-14.*

Olowonefa, GS & Agbade, OP. (2023). Management of Universal Basic Education in Nigeria: Challenges and way forward. *Best Journal of Innovation in Science,*

Research and Development, 2(9), 97-105.

Opara, J.C., Agbade**,** OP & Ihekoronye, E.O. (2020). Assessment of parents' perception on the impact of covid-19 pandemic school closure on secondary school students in Gwagwalada Area Council, Abuja. *Benue State University Journal of Educational Management*. 2(1), 93-102.

Patrick, EO, Usua, OB, Agbade, OP, Ali, P. & Ekpe, VE (2025). Early marriage and the educational attainment of the girl-child in Bekwarra Local Government Area of Cross River State, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED), 6(2),*138-147.

Patrick, EO, Agbade, OP. & Bassey, RO (2026). Adult education in the age of artificial intelligence: Exploring human-machine partnership. *Education for Today, 22(1), 408-415.*

Schunk, D. H., & Greene, J. A. (2018). *Handbook of self-regulation of learning and performance* (2nd ed.). Routledge.

Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.

UNESCO. (2023). *Guidance for generative AI in education and research*. United Nations Educational, Scientific and Cultural Organization. https://unesdoc.unesco.org/

Ushie, GB., Olofu, PA, Ekpenyong, VO, Ukpanukpong, FA. & Abuokwen, AA (2023). Parental socio-economic factors and child abuse tendencies in Obudu Local Government Area of Cross River State. *Kampala International University Journal of Education,* 3(2), 166-172.

Usua, OB, Agbade, OP. & Ogunode, NJ (2023). Impact of coaching leadership style on secondary school administration, teachers' job performance and secondary school students' academic performance in public secondary schools in Federal Capital Territory, Abuja. *International Journal of Development and Public Policy,* 3(11), 22-30.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education, 16*(39). https://doi.org/10.1186/s41239-019- 0171-0

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice, 41*(2), 64–70.