
**IMPACT OF ARTIFICIAL INTELLIGENCE-BASED LEARNING TOOLS ON THE
ACADEMIC PERFORMANCE OF ECONOMICS STUDENTS IN UMARU SANDA
AHMADU COLLEGE OF EDUCATION, MINNA.**

JIYA STEPHEN¹, HADIZA SALE KUTA²

^{1&2} Department of Economics, Umaru Sanda Ahmadu College of Education Minna.

ORCID.ID: 0009-0006-2237-0717

Corresponding Author: stephenjiva10@mail.com, 08036988148

Abstract

This study examined the impact of Artificial Intelligence (AI)-based learning tools on the academic performance of Economics students at the Umaru Sanda Ahmadu College of Education, Minna. Specifically, the study investigated the extent of utilization of AI-based learning tools, their impact on students' academic performance, and the challenges associated with their use. A descriptive survey research design was adopted. The population comprised NCE II and NCE III Economics students, from which a sample of 178 respondents was selected using the Taro Yamane formula and simple random sampling technique. Data were collected using a researcher-developed questionnaire titled Artificial Intelligence-Based Learning Tools and Academic Performance Questionnaire (AIBLTAPQ). The instrument was validated by experts, while its reliability was established using the Cronbach Alpha method. Data were analyzed using mean and standard deviation. The findings revealed that Economics students utilized AI-based learning tools to a high extent (Grand Mean = 4.21). The study further showed that AI-based learning tools had a positive impact on students' academic performance (Grand Mean = 4.20) by improving their understanding of Economics concepts, assignment quality, examination preparation, and learning confidence. However, poor internet connectivity, high cost of data, unstable electricity supply, limited AI literacy, and concerns about inaccurate AI-generated information were identified as major challenges (Grand Mean = 4.24). The study concluded that AI-based learning tools positively influence the academic performance of Economics students when used responsibly. It recommended improved digital infrastructure, regular AI literacy training, and the integration of AI literacy into the NCE curriculum to promote the effective and ethical use of AI in teaching and learning.

Keywords: Artificial Intelligence, AI-based Learning Tools, Academic Performance, Economics Students, Colleges of Education.

Introduction

Artificial Intelligence (AI) has become one of the most influential technological innovations shaping education in the twenty-first century. AI refers to computer systems designed to perform tasks that normally require human intelligence, such as reasoning, problem-solving, language understanding, decision-making, and learning from experience. In education, AI has transformed teaching and learning by providing intelligent learning environments that personalize instruction, automate routine tasks, and improve students' access to knowledge (Adeyanju, 2022). The widespread availability of AI-powered learning tools has significantly changed how students acquire knowledge and interact with educational content. Unlike conventional learning methods that rely mainly on classroom instruction and printed materials, AI-based tools provide instant feedback, personalized explanations, adaptive assessments, and interactive learning experiences. Applications such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, Quizlet AI, Khanmigo, and other intelligent tutoring systems enable students to understand difficult concepts, summarize academic materials, generate practice questions, solve numerical problems, and improve academic writing. These innovations have expanded learning opportunities beyond the classroom and support self-paced learning (Obilor. & Nwaigbo, 2022).

In Economics education, AI-based learning tools are particularly valuable because the discipline requires analytical thinking, mathematical reasoning, data interpretation, and problem-solving skills. AI applications assist students in explaining economic theories, analysing graphs, interpreting statistical data, generating practice exercises, and receiving immediate feedback on their learning. When used appropriately, these tools have the potential to enhance students' understanding of Economics concepts and improve their academic performance. Globally, higher education institutions are increasingly integrating AI into teaching, learning, and assessment through intelligent tutoring systems, adaptive learning platforms, and automated feedback tools. Research suggests that the effective use of AI can improve students' engagement, motivation, and learning outcomes. However, scholars also warn that excessive dependence on AI may reduce critical thinking skills and threaten academic integrity if used irresponsibly. Consequently, educational institutions are encouraged to promote ethical and responsible AI use alongside conventional teaching methods (Adegboye & Bello, 2020).

In Nigeria, the adoption of AI-based learning tools has grown rapidly following the emergence of freely accessible generative AI applications. Students in tertiary institutions increasingly use these technologies for note summarization, assignment support, examination preparation, research, and academic writing. While AI provides greater access to educational resources and personalized learning opportunities, concerns remain regarding plagiarism, misinformation, overdependence on AI-generated content, and inadequate digital literacy (Nwaigbo 2022). At the Umaru Sanda Ahmadu College of Education, Minna, many Economics students have begun using AI

applications to support their academic activities. Despite the growing popularity of these tools, there is limited empirical evidence on their influence on students' academic performance. Their effectiveness may depend on factors such as students' digital literacy, responsible use of AI, lecturer guidance, institutional support, and access to reliable internet services (Adu & Oyewole, 2022).

Therefore, this study seeks to examine the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students at the Umaru Sanda Ahmadu College of Education, Minna. The findings are expected to provide useful evidence for lecturers, curriculum developers, educational administrators, and policymakers on how AI can be effectively and responsibly integrated into Economics education to improve teaching and learning outcomes.

Artificial Intelligence (AI) has become an important innovation in higher education, with AI-based learning tools such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, and other intelligent tutoring systems increasingly being used by students to support learning. These tools provide instant feedback, personalized learning experiences, and easy access to educational resources, enabling students to understand difficult concepts, complete assignments, prepare for examinations, and conduct research more efficiently. Although many studies suggest that AI can improve students' engagement and academic performance, concerns have also been raised about its misuse. Excessive dependence on AI may reduce critical thinking, creativity, independent learning, and problem-solving skills, while issues such as plagiarism, misinformation, and academic dishonesty continue to generate concern among educators.

In Nigeria, the use of AI-based learning tools has grown rapidly among students in tertiary institutions. However, differences in digital literacy, internet accessibility, institutional support, and lecturers' acceptance of AI may influence how effectively these technologies contribute to students' academic success. Although previous studies have examined the application of AI in education, most have focused on universities, online learning environments, or students from other academic disciplines. Consequently, there is limited empirical evidence on the impact of AI-based learning tools on the academic performance of Economics students in Colleges of Education, particularly at the Umaru Sanda Ahmadu College of Education, Minna. Furthermore, little is known about the AI tools commonly used by these students, the extent of their utilization, the benefits they derive, and the challenges affecting their effective use.

It is against this background that this study seeks to examine the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students at the Umaru Sanda Ahmadu College of Education, Minna. Specifically, the study will investigate the extent to which AI-based learning tools influence students' academic performance, identify the AI tools commonly used by Economics students, examine the benefits associated with their use, and determine the

challenges affecting their effective utilization. The findings of the study are expected to provide empirical evidence that will assist lecturers, curriculum developers, educational administrators, and policymakers in developing appropriate strategies and guidelines for the effective and responsible integration of AI into Economics education.

The main objective of this study is to examine the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students in the Umaru Sanda Ahmadu College of Education, Minna.

The specific objectives are to:

1. Examine the extent to which Economics students utilize Artificial Intelligence-based learning tools in the Umaru Sanda Ahmadu College of Education, Minna.
2. Determine the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students in the Umaru Sanda Ahmadu College of Education, Minna.
3. Identify the challenges associated with the use of Artificial Intelligence-based learning tools among Economics students in the Umaru Sanda Ahmadu College of Education, Minna.

The following research questions guide the study:

- To what extent do Economics students utilize Artificial Intelligence-based learning tools in the Umaru Sanda Ahmadu of Education, Minna?
- What is the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students in the Umaru Sanda Ahmadu College of Education, Minna?
- What challenges are associated with the use of Artificial Intelligence-based learning tools among Economics students in the Umaru Sanda Ahmadu College of Education, Minna?

LITERATURE REVIEW

Conceptual Review

Concept of Artificial Intelligence

Artificial Intelligence (AI) refers to computer systems and digital technologies designed to perform tasks that normally require human intelligence, such as learning, reasoning, problem-solving, decision-making, and language understanding. The concept was first introduced by John McCarthy

in 1956, who defined AI as the science and engineering of creating intelligent machines. Advances in machine learning, big data, and cloud computing have since accelerated the development and application of AI across various sectors, including education.

In education, AI has transformed teaching and learning by providing personalized learning experiences, instant feedback, adaptive assessments, and intelligent tutoring. AI-powered applications such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, Quizlet AI, and Khanmigo enable students to understand difficult concepts, summarize learning materials, solve problems, improve academic writing, and prepare for examinations. These tools support independent learning and make educational resources more accessible.

For Economics students, AI-based learning tools are particularly useful because they assist in explaining economic theories, analyzing data, interpreting graphs, solving quantitative problems, and conducting academic research. Their use can enhance students' understanding of course content, improve learning engagement, and contribute to better academic performance when used responsibly.

Despite these benefits, AI also presents challenges, including overdependence on AI-generated responses, plagiarism, academic dishonesty, privacy concerns, and the risk of inaccurate information. Therefore, students need adequate digital literacy and ethical guidance to ensure that AI complements rather than replaces independent learning. In this study, Artificial Intelligence refers to AI-based learning tools used by Economics students to support learning, research, assignment completion, and examination preparation with the aim of improving their academic performance.

Artificial Intelligence-Based Learning Tools

Artificial Intelligence (AI)-based learning tools are educational technologies that use AI techniques, such as machine learning and natural language processing, to enhance teaching and learning. These tools provide personalized instruction, instant feedback, adaptive assessments, and interactive learning experiences that enable students to learn more effectively and at their own pace. Unlike conventional learning resources, AI-based tools respond to individual learning needs by providing explanations, recommending relevant study materials, and assisting students in understanding difficult concepts.

Common AI-based learning tools used in higher education include ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, Quizlet AI, Claude, Perplexity AI, and Khanmigo. These applications support students by explaining concepts, generating examples, improving academic writing, assisting with research, creating practice questions, and facilitating examination preparation. For Economics students, they are particularly useful for explaining economic theories,

analyzing data, interpreting graphs, solving quantitative problems, and improving research and presentation skills.

Although AI-based learning tools offer significant educational benefits, their effectiveness depends on how they are used. Responsible use can improve learning engagement, independent study, and academic performance, whereas excessive reliance on AI may reduce critical thinking, encourage plagiarism, and undermine independent learning. In this study, AI-based learning tools refer to AI-powered digital applications used by Economics students to support learning, research, assignment completion, and examination preparation with the aim of improving their academic performance.

Academic Performance

Academic performance refers to the extent to which students achieve the intended learning outcomes of their educational programme. It reflects the knowledge, skills, and competencies acquired through learning and is commonly measured using examination scores, continuous assessment, assignments, grade point average (GPA), and other indicators of academic achievement. In Economics education, academic performance includes students' ability to understand economic theories, interpret data, solve quantitative problems, and apply economic principles to real-life situations. Academic performance is influenced by several factors, including study habits, motivation, teaching methods, learning resources, digital literacy, institutional support, and access to technology. In recent years, the use of Artificial Intelligence (AI)-based learning tools has become an important factor that may enhance students' learning by providing instant feedback, personalized instruction, research support, and opportunities for independent study. When used appropriately, these tools can improve students' understanding of course content, examination preparation, and overall academic achievement.

However, the educational benefits of AI depend on how it is used. Responsible use can promote learning engagement and better academic performance, while excessive dependence on AI may reduce critical thinking, creativity, and independent problem-solving skills. In this study, academic performance refers to the level of academic achievement attained by Economics students at the Umaru Sanda Ahmadu College of Education, Minna, as influenced by their use of AI-based learning tools. It is assessed based on students' perceived improvement in understanding Economics concepts, assignment quality, examination preparation, class participation, problem-solving ability, and overall academic achievement.

Theoretical Framework

A theoretical framework provides the foundation upon which a study is built. It explains the theories that guide the study and helps to establish the relationship between the variables under

investigation. This study is anchored on the **Technology Acceptance Model (TAM)** and supported by the **Constructivist Learning Theory**. These theories explain how students adopt Artificial Intelligence (AI)-based learning tools and how the use of these tools can improve learning and academic performance.

Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was developed by Davis (1989) to explain the factors that influence individuals' acceptance and use of new technologies. The model identifies two key determinants of technology adoption: Perceived Usefulness (PU), which is the extent to which a person believes that using a technology, will improve performance, and Perceived Ease of Use (PEOU), which refers to the extent to which a technology is perceived as easy to learn and use.

According to TAM, when students perceive AI-based learning tools as useful and easy to use, they are more likely to develop positive attitudes towards them and use them regularly for academic activities. In the context of this study, Economics students are expected to adopt AI tools such as ChatGPT, Google Gemini, Microsoft Copilot, Grammarly, and Quizlet AI if they believe these technologies enhance learning, improve assignment quality, and support better academic performance. The Technology Acceptance Model is relevant to this study because it provides a theoretical basis for understanding the adoption and use of AI-based learning tools by Economics students. It explains how students' perceptions of the usefulness and ease of use of these technologies can influence their utilization and, ultimately, their academic performance.

Constructivist Learning Theory

The Constructivist Learning Theory, developed by Jerome Bruner (1961), is based on the idea that learners actively construct knowledge through experience, interaction, and problem-solving rather than passively receiving information. The theory emphasizes that meaningful learning occurs when students actively participate in the learning process, relate new knowledge to prior experiences, and apply what they have learned to real-life situations, while teachers serve as facilitators of learning.

AI-based learning tools support the principles of constructivism by providing interactive, personalized, and self-paced learning experiences. They enable students to ask questions, receive immediate feedback, explore different solutions, and strengthen their understanding of course content. For Economics students, these tools facilitate the learning of economic theories, data analysis, graph interpretation, and problem-solving, thereby promoting independent learning and critical thinking. The Constructivist Learning Theory is relevant to this study because it explains how AI-based learning tools can encourage active learning, improve students' engagement with Economics, and enhance their academic performance through meaningful learning experiences.

Empirical Review

Several empirical studies have examined the influence of Artificial Intelligence (AI) on students' learning and academic performance. Hassan (2026) investigated the effect of AI-supported learning among undergraduate Economics and Business students in the United Kingdom using a mixed-method design. The study found that AI significantly improved students' engagement, understanding of course content, and academic performance. However, the study was conducted in a university setting in a developed country, limiting its applicability to Colleges of Education in Nigeria.

In Nigeria, Aliyu, Garba and Dape (2026) employed a descriptive survey to examine the impact of AI-assisted learning tools on secondary school students. The findings revealed that AI improved students' study habits, motivation, and academic performance, although the study focused on secondary school students. Similarly, Ogundola and Ogunleye (2026) found that AI positively influenced the academic performance and digital skills of Business Education students in tertiary institutions in Ekiti State. Researchers at Nnamdi Azikiwe University (2026) also reported that students perceived AI as beneficial for improving academic performance, provided there was adequate digital infrastructure and AI training.

Furthermore, Onyemelukwe, Amaechi and Ndidi (2026) reported that AI enhanced learning outcomes and classroom engagement across six Nigerian universities but identified inadequate digital infrastructure and limited ethical awareness as major challenges. Likewise, Iferi et al. (2026) found that AI positively influenced students' research engagement, particularly among those with strong digital literacy and institutional support. Ward, Bhati, Neha and Guercio (2024) also observed that AI improved personalized learning, study habits, and academic performance but cautioned that excessive dependence on AI could weaken critical thinking and independent learning.

Methodology

This study adopted a descriptive survey research design to examine the impact of Artificial Intelligence (AI)-based learning tools on the academic performance of Economics students in the Umaru Sanda Ahmadu College of Education, Minna. The design was considered appropriate because it enabled the collection of data from respondents without manipulating any variables. The study was conducted in the Department of Economics, Umaru Ahmadu College of Education, Minna, Niger State, Nigeria. The target population comprised all NCE II and NCE III Economics students during the 2025/2026 academic session. A representative sample of 178 was selected using the Taro Yamane formula, while a simple random sampling technique was employed to ensure that every student had an equal chance of being selected. Data were collected using a researcher-developed questionnaire titled "Artificial Intelligence-Based Learning Tools and

Academic Performance Questionnaire (AIBLTAPQ)." The instrument consisted of two sections: Section A collected respondents' demographic information, while Section B contained items on the utilization of AI-based learning tools, their impact on academic performance, and the challenges associated with their use. Responses were measured on a five-point Likert scale. The questionnaire was validated by experts in Economics Education, Educational Technology, and Measurement and Evaluation from the College to ensure its face and content validity. Its reliability was established through a pilot study using the Cronbach's Alpha reliability method, with a coefficient of 0.70 and above considered acceptable. Data were collected through direct administration of the questionnaire with the assistance of research assistants. The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS), Version 29. Descriptive statistics, including means, and standard deviations, were used to answer the research questions, while the hypotheses were tested using the Pearson Product Moment Correlation (PPMC) at the 0.05 level of significance. Ethical principles of voluntary participation, confidentiality, anonymity, and informed consent were observed throughout the study. Decision Rule: For the research questions, a mean score of 3.00 and above was considered an indication of agreement or a positive response, while a mean score below 3.00 was considered an indication of disagreement or a negative response. For the hypotheses, the null hypothesis was rejected where the calculated p-value was less than 0.05 ($p < 0.05$), and retained where the calculated p-value was greater than or equal to 0.05 ($p \geq 0.05$).

Results

Research Question One

To what extent do Economics students utilize Artificial Intelligence-based learning tools in the Umaru Sanda Ahmadu College of Education, Minna?

Table 1: Mean Responses on the Utilization of AI-Based Learning Tools (n = 178)

S/N	Statement	Mean	SD	Decision
1	I use ChatGPT to understand difficult Economics concepts.	4.23	0.81	Agree
2	I use AI tools to complete assignments and classwork.	4.11	0.87	Agree
3	AI tools help me prepare for examinations.	4.29	0.75	Agree
4	I use AI tools to search for academic information.	4.35	0.69	Agree

S/N	Statement	Mean	SD	Decision
5	I use AI tools regularly for my Economics studies.	4.08	0.92	Agree
Grand Mean		4.21	0.81	High Extent

Table 1 above presents the mean responses of Economics students on the utilization of AI-based learning tools. The results indicate that respondents generally agreed that they use AI-based learning tools to support their academic activities, as reflected in the grand mean of 4.21 with a standard deviation of 0.81, indicating a high extent of utilization. Specifically, the statement "I use AI tools to search for academic information" recorded the highest mean score ($M = 4.35$, $SD = 0.69$), indicating that searching for academic information is the most common use of AI among the students. This was followed by "AI tools help me prepare for examinations" ($M = 4.29$, $SD = 0.75$) and "I use ChatGPT to understand difficult Economics concepts" ($M = 4.23$, $SD = 0.81$), suggesting that students extensively use AI to enhance their understanding of course content and prepare for assessments. Furthermore, respondents agreed that they use AI tools to complete assignments and class work ($M = 4.11$, $SD = 0.87$) and regularly use AI tools for their Economics studies ($M = 4.08$, $SD = 0.92$). Although these statements recorded the lowest mean scores among the items, they were still above the acceptance benchmark, indicating a high level of agreement.

Research Question Two

What is the impact of Artificial Intelligence-based learning tools on the academic performance of Economics students?

Table 2: Impact of AI-Based Learning Tools on Academic Performance (n = 178)

S/N	Statement	Mean	SD	Decision
1	AI improves my understanding of Economics concepts.	4.32	0.73	Agree
2	AI helps me produce better assignments.	4.18	0.80	Agree
3	AI improves my examination preparation.	4.27	0.77	Agree
4	AI has improved my overall academic performance.	4.16	0.86	Agree
5	AI increases my confidence in learning Economics.	4.09	0.88	Agree

S/N	Statement	Mean	SD	Decision
Grand Mean		4.20	0.81	Positive Impact

Table 2 above shows that AI-based learning tools have a positive impact on the academic performance of Economics students, as indicated by the grand mean of 4.20 and a standard deviation of 0.81. All the items recorded mean scores above the acceptance level, indicating that the respondents agreed that AI positively influences their academic performance. Specifically, the statement "AI improves my understanding of Economics concepts" recorded the highest mean score ($M = 4.32$, $SD = 0.73$), followed by "AI improves my examination preparation" ($M = 4.27$, $SD = 0.77$). Respondents also agreed that AI helps them produce better assignments ($M = 4.18$, $SD = 0.80$), improves their overall academic performance ($M = 4.16$, $SD = 0.86$), and increases their confidence in learning Economics ($M = 4.09$, $SD = 0.88$).

Overall, the findings indicate that AI-based learning tools positively influence students' understanding of Economics, assignment quality, examination preparation, confidence, and overall academic performance.

Research Question Three

What challenges are associated with the use of Artificial Intelligence-based learning tools?

Table 3: Challenges Associated with AI-Based Learning Tools (n = 178)

S/N	Statement	Mean	SD	Decision
1	Poor internet connectivity affects my use of AI tools.	4.41	0.71	Agree
2	High cost of internet data limits my use of AI.	4.36	0.78	Agree
3	Unstable electricity affects access to AI tools.	4.28	0.82	Agree
4	Some AI information is inaccurate or misleading.	3.94	0.90	Agree
5	I need more training to use AI effectively.	4.22	0.79	Agree
Grand Mean		4.24	0.80	Agree

Table 3 above presents the mean responses of Economics students on the challenges associated with the use of AI-based learning tools. The results indicate that respondents agreed that several challenges hinder the effective use of AI-based learning tools, as shown by the grand mean of 4.24

and a standard deviation of 0.80. Among the identified challenges, "Poor internet connectivity affects my use of AI tools" recorded the highest mean score ($M = 4.41$, $SD = 0.71$), indicating that it is the most significant challenge faced by the students. This was followed by the high cost of internet data ($M = 4.36$, $SD = 0.78$) and unstable electricity ($M = 4.28$, $SD = 0.82$), suggesting that inadequate digital infrastructure limits students' effective use of AI. Respondents also agreed that they need more training to use AI effectively ($M = 4.22$, $SD = 0.79$) and that some AI information is inaccurate or misleading ($M = 3.94$, $SD = 0.90$), although this was the least-rated challenge.

Conclusion

Based on the findings of the study, it is concluded that Artificial Intelligence (AI)-based learning tools have a positive influence on the academic performance of Economics students at the Umaru Sanda Ahmadu College of Education, Minna. The study revealed that students utilize AI tools to a high extent for learning, assignment completion, research, and examination preparation, thereby improving their understanding of Economics concepts and overall academic performance. However, the effective use of AI is constrained by challenges such as poor internet connectivity, high cost of data, unstable electricity supply, and limited AI literacy. Therefore, AI should be used as a complement to classroom instruction, with adequate institutional support and ethical guidelines to maximize its educational benefits.

Recommendations

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

1. The management of the Umaru Sanda Ahmadu College of Education, Minna should provide adequate digital infrastructure, including reliable internet access, functional ICT facilities, stable electricity, and regular training for both lecturers and students on the effective and ethical use of AI-based learning tools.
2. Economics lecturers should encourage the responsible use of AI-based learning tools as supplementary resources for teaching, learning, research, assignments, and examination preparation while promoting academic integrity, critical thinking, and independent learning.
3. The National Commission for Colleges of Education (NCCE) should incorporate Artificial Intelligence literacy into the NCE curriculum to equip student-teachers with the digital competencies and ethical knowledge required for effective AI integration in education

References

- Adegboye, M., & Bello, W. (2020). Artificial intelligence usage among economics students in higher education institutions in North Central, Nigeria. *African Journal of Education Research and Development*, 12(18), 88–96.
- Adeyanju, J. H. (2022). Influence of artificial intelligence-assisted learning tools on the academic performance and study habits of secondary school students in Nigeria. *Nigerian Journal of Educational Studies*, 11(2), 99–114.
- Adu, G. D., & Oyewole, Y. I. (2022). Artificial intelligence usage and its influence on academic performance. *Journal of Educational Research*.
- Aliyu, A., Garba, M., & Dape, S. (2026). Impact of artificial intelligence-assisted learning tools on the academic performance and study habits of secondary school students in Nigeria. *IIARD International Journal*.
- Bruner, J. S. (1961). The act of discovery. *Harvard Educational Review*, 31(1), 21–32.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- Hassan, A. (2026). *Artificial intelligence, student engagement, and academic performance among economics and business undergraduates*. Springer.
- Iferi, E., Adeyemi, T., Okafor, C., & Bello, M. (2026). Influence of artificial intelligence tools on research engagement among higher education students in Nigeria. *Frontiers in Education*.
- McCarthy, J. (2007). *What is artificial intelligence?* Stanford University. <http://jmc.stanford.edu/articles/whatisai/whatisai.pdf>
- Nwaigbo, F. R. (2022). *Impact of artificial intelligence tools on social studies students' academic performance in colleges of education in Benue State, Nigeria*.
- Obilor, E. T., & Nwaigbo, G. (2022). *Artificial intelligence, student engagement, interest and academic achievement among economics and business undergraduates*. University of Nigeria, Nsukka.
- Ogundola, O., & Ogunleye, A. (2026). Impact of artificial intelligence tools on Business Education students' academic performance in tertiary institutions in Ekiti State, Nigeria.
- Onyemelukwe, C., Amaechi, J., & Ndidi, E. (2026). Performance and educational impact of artificial intelligence tools across Nigerian universities. *International Journal of Technology and Human Sciences*.

Researchers at Nnamdi Azikiwe University. (2026). Students' perceptions of artificial intelligence usage and its influence on academic performance. *Nnamdi Azikiwe University Journal of Educational Research*.

Ward, P., Bhati, R., Neha, S., & Guercio, A. (2024). Artificial intelligence tools, study habits, and academic performance of students. *arXiv*. <https://arxiv.org/>