PERCEIVED IMPACT OF ARTIFICIAL INTELLIGENCE ON STUDENTS' LEARNING OUTCOMES IN NNAMDI AZIKIWE UNIVERSITY, AWKA, ANAMBRA STATE

Forgive Nkiru Amaefule,
fn.amaefule@unizik.edu.ng
Department of Educational Management and Policy,
Faculty of Education
Nnamdi Azikiwe University, Awka

Nwogbo Mercy Obianuju,
mo.nwogbo@unizik.edu.ng
Department of Educational Management and Policy
Faculty of Education,
Nnamdi Azikiwe University, Awka

&

Michael Kenechi Christiana
kc.michael@unizik.edu.ng
Department of Educational Management and Policy
Faculty of Education
Nnamdi Azikiwe University, Awka

Abstract

The study examined perceived impact of artificial intelligence on students' learning outcomes at Nnamdi Azikiwe University, Awka. This study adopted descriptive survey research design. The population comprised 34,376 students in Nnamdi Azikiwe University, Awka. This population comprised 15,288 male students and 19,088 female students. A multi-stage sampling technique was used for the study. Simple random sampling was used to select four (4) faculties of the school. Using accidental sampling technique, 120 male and 120 female students were selected making the total number of respondents to be 240. A structured questionnaire was used to collect data. Cronbach Alpha was used to determine the reliability and yielded an average Cronbach reliability value of 0.89, indicating that the instrument was reliable for the study. Mean scores and standard deviation were used to analyse the data and the decision point was set at 2.50. Mean scores of 2.50 and above were considered as agreed and mean scores below 2.50 as disagreed. A T-test was conducted to test the hypotheses formulated for the study. The study found that AI has significantly enhanced students' learning outcomes by facilitating a deeper understanding of subject matter. It aids in grasping core concepts, finding optimal learning methods, and connecting topics across disciplines. Moreover, AI empowers students to integrate knowledge from diverse fields and stay updated with recent advancements. It promotes practical application of learning in real-world scenarios and provides access to a plethora of educational resources, including textbooks. The study recommended that school management should integrate AI in teaching and learning in universities. Government should provide infrastructural facilities such as Internet and computers among others so as to support the use of AI in schools.

Keywords: *Artificial Intelligence, Students, Learning Outcome*

Introduction

Education is one avenue that has been used to illuminate the human mind and improve societal development because it empowers individuals with knowledge, critical thinking skills, and the ability to innovate. Through education, people learn to solve complex problems, engage in thoughtful discourse, and contribute meaningfully to society. More interestingly, the evolution of information and communication technology (ICT) has changed every human endeavor. The education system is not an exception to the impact of ICT, which has profoundly transformed how education is delivered, accessed, and experienced. Mureșan (2023) affirmed that with the intervention of the technology such as the internet and digital technology, the online platform is trending slowly and surely taking the place of classrooms.

The integration of ICT into education has revolutionized traditional educational practices. Prinsloo, Slade and Khalil (2021) posited that as higher education has become increasingly digital and digitized, not only have pedagogies, curricula, and assessment practices changed in response to the availability of synchronous and asynchronous technologies, but institutions have also had access to more detailed and often real-time student and learning data from a variety of sources. Digital tools and online platforms as Cevikbas and Kaiser (2022) stated have created more interactive and personalized learning environments. These advancements facilitate better engagement and comprehension among students. E-learning platforms, digital textbooks, and virtual classrooms have become integral components of modern education, making learning more accessible and flexible.

With the advancement of ICT in education, Mureșan (2023) emphasized that since ancient times, the method of learning is constantly evolving and undergoing numerous changes due to new technologies. Consequently, one aspect of ICT that has revolutionized students' learning outcomes is artificial intelligence (AI). Artificial intelligence is a branch of computer science focused on creating systems capable of performing tasks that typically require human intelligence, such as learning, reasoning, and problem-solving. Timothy and Onyeukwu (2023) noted that Artificial Intelligence (AI) is the creation of computer systems capable of performing tasks that historically only humans could do, such as reasoning, making decisions or solving problems. It is also the mechanical stimulation of human intelligence processes, especially of computer systems.

Kaledio, Robert and Frank (2024) added that one of the significant advantages of AI in education is its ability to provide immediate and constructive feedback to students. Traditionally, students had to wait for their assignments to be graded by teachers, which often resulted in delayed feedback. With AI-powered automated grading systems, students can receive timely feedback on their work, enabling them to understand their mistakes, make corrections, and improve their learning outcomes. This real-time feedback fosters a sense of self-reflection and empowers students to take an active role in their own learning process.

In education, AI is utilized to develop adaptive learning technologies, intelligent tutoring systems, and predictive analytics tools. Adaptive learning technologies use AI to personalize the educational experience for each student. Qiong and Lihong (2023) asserted that these platforms personalize learning by adapting content and exercises based on each student's individual strengths, weaknesses, preferences and pace, making learning more targeted and effective. In addition, these platforms are particularly useful when it comes to identifying gaps in knowledge and providing tutoring content in real time. Students no longer have to wait for an end-of-semester assessment to find out where they need to improve. By analyzing data on a student's performance and learning habits, these systems can adjust the difficulty level of assignments, provide tailored feedback, and suggest resources that address specific learning needs. This personalized approach helps students learn more effectively and efficiently, improving their overall academic performance. A study conducted by Wang and Heffernan (2019) found that students using AI-powered adaptive learning platforms showed significant improvement in their test scores compared to those who did not use such platforms.

Intelligent tutoring systems (ITS) represent another significant AI-driven advancement in education. ITS can simulate one-on-one tutoring by providing personalized instruction and feedback based on the student's progress. These systems can diagnose misconceptions, offer step-by-step guidance, and adapt content to suit the learner's needs. VanLehn (2011) indicates that ITS can be as effective as human tutors in improving student learning outcomes, particularly in subjects such as mathematics and science. Mahendra (2023) affirms that these AI tools can be used to create tutorials and interactive virtual assistants, systems that can answer students' questions, provide additional explanations and guide students through the learning process in real time. Through tutorials and virtual assistants, students can benefit from additional support and learn at an individual pace by being guided in real time to support the learning process.

In addition, AI-supported educational analyses offer valuable insights into the performance and learning behavior of students. By analyzing large data sets from various educational activities, AI can identify patterns and trends that help educators make informed decisions about instructional strategies and interventions. This data-driven approach enables more targeted and effective teaching, which ultimately leads to better outcomes for students. Siemens and Long (2011) established that the use of learning analytics can significantly enhance the understanding of student progress and support the development of personalized learning paths. The United Nations Educational, Scientific and Cultural Organization [UNESCO] (2019) added that the use of AI to improve learning outcomes provides examples of how AI technology can help education systems use data to improve teaching in developing countries.

Many countries in the world, such as the United States, China, and the United Kingdom, have integrated AI in students' learning (Bhutoria, 2022). These nations have recognized the potential of AI to enhance educational outcomes through personalized learning experiences and data-driven insights. More so, some African countries such as South Africa, Kenya, and Egypt have also integrated AI in students' learning (Gwagwa, Kachidza, Siminyu & Smith, 2021). These countries are leveraging AI to address educational challenges, improve access to quality education, and foster innovation in teaching and learning. It was for some of these reasons Nwadinobi, Etele, Ezebube, Monyei and Ukpere (2024) asserted that artificial intelligence will be used in 40% of advanced change projects from 2019 and 75% of commercial applications will be based on simulated intelligence by 2021.

Unfortunately, some Nigerian schools have accepted the use of AI in teaching the students, and some are still struggling to allow AI to be used in students' learning because of various challenges. These challenges include inadequate infrastructure, lack of funding, and insufficient training for teachers to effectively implement AI technologies. Ibrahim (2024) and Onyema (2020) highlighted that the adoption of AI in Nigerian education is hindered by limited technological resources and a lack of awareness about the benefits of AI among educators and policymakers.

In Anambra State, much has not been known about students utilizing AI in learning because of these same challenges, as well as a general lack of integration strategies at the state level. The absence of a comprehensive framework for incorporating AI in education has led to sporadic and uncoordinated efforts, resulting in minimal impact. As a result, many of the students do not understand the impact of the use of AI in learning. Despite these challenges, Okoye and Nwankwo (2023) highlight that some students in Anambra State are aware of the potential benefits of AI. This could not be different from students at Nnamdi Azikiwe University, Awka, as many students are familiar with the use of AI. Nguyen and Rasmussen (2016) added that despite the challenges posed by the use of AI in schools, it is increasingly recognised that AI can have a significant impact on improving educational outcomes. With this in mind, this study sought to investigate the perceived impact of artificial intelligence on students' learning outcome at Nnamdi Azikiwe University, Awka.

Statement of the Problem

The development of artificial intelligence has changed the learning patterns at most universities around the world. Any country or university that is slow to integrate AI into their institutions, or does not integrate it at all, could fall behind, as AI-driven tools enhance personalised learning, provide valuable data insights and promote innovative educational practises. For some of these reasons, this study was initiated to investigate the perceived impact of artificial intelligence on students' learning outcomes at Nnamdi Azikiwe University, Awka. By understanding these impacts, the university aims to better utilise AI technologies to improve educational outcomes.

Purpose of the Study

The main purpose of the study is to examine perceived impact of artificial intelligence on students' learning outcomes at Nnamdi Azikiwe University, Awka. Specifically, this study sought to:

1. Examine the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka.
2. Determine the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka.

Research Questions

1. What is the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka?
2. What is the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka?

Hypotheses

$H_0$1: There is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka.

$H_0$2: There is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka.

Methods

This study adopted descriptive survey research design. The population comprised 34,376 students in Nnamdi Azikiwe University, Awka. This population comprised 15,288 male students and 19,088 female students. A multi-stage sampling technique was used for the study. Simple random sampling was used to select four (4) faculties of the school. Using accidental sampling technique, 120 male and 120 female students were selected making the total number of respondents to be 240. A structured questionnaire was used to collect data. The questionnaire consisted of two clusters, clusters A and B, which are related to the respective research questions. The questionnaire was structured on a 4-point scale and with a total of 14 items. The questionnaire was validated by two research experts, one from the Department of Educational Management and Policy and the second from the Department of Educational Foundations. The purpose of the validation was to ensure that the questionnaire items answered the research questions. The questionnaire was subjected to test re-tested to ensure the consistency of the instrument. Twenty (20) undergraduate students of Chukwuemeka Odumegwu Ojukwu University, Igbariam were used to determine the reliability of the instrument. Cronbach Alpha was used to determine the reliability and yielded an average Cronbach reliability value of 0.89, indicating that the instrument was reliable for the study. The researcher, along with two research assistants, personally distributed the questionnaire to the respondents. After distributing the 240 copies of the questionnaire, which is 100 percent of the questionnaire, 233 (97.33%) correctly completed copies

of the questionnaire were used for data analysis. Mean scores and standard deviation were used to analyse the data and the decision point was set at 2.50. Mean scores of 2.50 and above were considered as agreed and mean scores below 2.50 as disagreed. A T-test was conducted to test the hypotheses formulated for the study.

Results

Research Question One: What is the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka?

Table 1: Mean ratings and standard deviation of perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka

		Male = 109		Female = 124	
S/N	Understanding of Subject Matter:	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2
1	In-depth understanding of the core concepts	3.35	.736	3.17	.930
2	Understanding the best ways to learn the subject	3.40	.787	3.05	.931
3	Get knowledge of how the subject relates to other discipline	3.19	.714	2.98	.779
4	Gain ability to integrate concepts across fields	3.40	.787	2.96	.902
5	Understand up-to-date knowledge of recent advancements	3.03	.875	2.77	.866
6	Understanding how the subject matter can be applied in real-world situations	2.68	.842	2.58	.768
7	Ability to identify to use a wide range of resources, including textbooks	3.15	.906	3.07	.760
	Average	**3.18**	**.798**	**3.01**	**.866**

Table 1 provided the mean ratings and standard deviation of perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka. The findings revealed that the mean score and standard deviation for male students were 3.18 and 0.798. Similarly, the mean score and standard deviation for the female students were 3.01 and 0.866. Both studies have mean scores that are above 2.50. These indicated that the students agreed that AI has impact on students' understanding of subject matter at Nnamdi Azikiwe University, Awka.

Research Question Two: What is the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka?

Table 2: Mean ratings and standard deviation of the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka

		Male = 109		Female = 124	
S/N	Application of technology in learning:	$\bar{X}_1$	SD_1	$\bar{X}_2$	SD_2
8	Ability to use search engines and databases to find academic sources	2.89	.983	3.10	.776
9	Working with peers on group projects using collaborative platforms like Google Docs, Microsoft Teams, or Slack	2.54	.847	2.96	.858
10	Help students participate in class discussions on learning management systems	3.46	.688	3.09	.722
11	Conducting simulations in virtual lab environments for science	3.02	.894	2.96	.786

12	Engaging with interactive tutorials that provide multimedia content	2.51	1.037	2.92	.909
13	Exploring virtual environments related to historical events, scientific concepts	2.52	1.037	2.92	.951
14	Gaining digital skills for learning	2.60	.917	2.91	.837
	Average	**2.86**	**.869**	**3.00**	**.845**

Table 2 provided the mean ratings and standard deviation of perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka. The findings revealed that the mean score and standard deviation for male students were 2.86 and 0.869. Similarly, the mean score and standard deviation for the female students were 3.00 and 0.845. Both studies have mean scores that are above 2.50. These indicated that the students agreed that of AI has impact on students' application of technology in learning at Nnamdi Azikiwe University, Awka.

Test of Hypothesis One

H_0: There is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka

Table 3: Summary of the t-test analysis of the differences in mean ratings of male and female students on the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka

Variable		No.	X	SD	df	Probability	t-Calculation	Crit. Table Value	Sig. (2-tailed)	Decision
Understanding subject matter	Female	124	3.01	.866	258	0.05	-1.668	4.303	.608	Not Sig.
	Male	109	3.18	.798						

The results on Table 3 reveal that the mean scores of female students' understanding subject matter is 3.01 while that of the male students was 3.18. More so, the calculated independent t-test, -1.668 is less than the critical table value of 4.303. On the other hand, the p-value (.608) was higher than .05 significant level. For these reasons, the null hypothesis was retained and the alternative hypothesis was not retained. Thus, there is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' understanding of subject matter at Nnamdi Azikiwe University, Awka. This implies that AI has impact on students' understanding of subject matter at Nnamdi Azikiwe University, Awka.

Test of Hypothesis Two

H_0: There is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka

Table 4: Summary of the t-test analysis of the differences in mean ratings of male and female students on the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka

Variable		No.	X	SD	df	Probability	t-Calculation	Crit. Table Value	Sig. (2-tailed)	Decision
Application of technology in learning	Female	124	3.00	.845	258	0.05	.246	4.303	.218	Not Sig.
	Male	109	2.86	.869						

The results on Table 4 reveal that the mean scores of female students' understanding subject matter is 3.00 while that of the male students was 2.86. More so, the calculated independent t-test, .246 is less than the critical table value of 4.303. On the other hand, the p-value (.214) was higher than .05 significant level. For these reasons, the null hypothesis was retained and the alternative hypothesis was not retained. Thus, there is no significant difference between the mean ratings of male and female students on the perceived impact of AI on students' application of technology in learning at Nnamdi Azikiwe University, Awka. This implies that AI has impact on students' application of technology in learning at Nnamdi Azikiwe University, Awka.

Discussions of the Findings

The results of research question one and test of hypothesis one revealed that students agreed that AI has impact on students' understanding of subject matter at Nnamdi Azikiwe University, Awka. This is because students' learning outcome involves understanding subject matter such as in-depth understanding of the core concepts, understanding the best ways to learn the subject, get knowledge of how the subject relates to other discipline, gain ability to integrate concepts across fields, understand up-to-date knowledge of recent advancements, understanding how the subject matter can be applied in real-world situations and ability to identify to use a wide range of resources, including textbooks. Robinson (2018) affirmed that AI technology can make the education system in Nigeria smarter. This can be done through the introduction of self-learning classrooms at every level of the educational institution. In this classroom, machines can be used to teach properly and answer questions on the spot in a universally accepted way. Cleopas (2023) confirms that AI will enable a changed academic path, better results and better prepared people. Emphasising the teaching and learning perspectives in the application of AI in the Nigerian education system is paramount as it can enhance the learning and teaching experience.

Also, the study found in research question two and test of hypothesis two that AI has impact on students' application of technology in learning at Nnamdi Azikiwe University, Awka. This is because students' learning outcome involves the application of technology in learning for students to have the ability to use search engines and databases to find academic sources, Work with peers on group projects using collaborative platforms like Google Docs, Microsoft Teams, or Slack, help students participate in class discussions on learning management systems, conducting simulations in virtual lab environments for science, engaging with interactive tutorials that provide multimedia content, explore virtual environments related to historical events, scientific concepts and gaining digital skills for learning. The findings of Okunade (2024) affirmed that the role of AI in learning includes the use of AI technologies such as adaptive learning systems, intelligent tutoring systems and virtual laboratories and simulations. These are used to personalise the learning process, provide interactive and individualised teaching and enable immersive digital experiments. Obi's (2022) findings confirm that AI-enhanced learning experiences can equip students with cutting-edge technologies and problem-solving skills, leading to a more technology and innovation-savvy workforce. Smith (2018) also agreed that the data generated by AI applications can facilitate evidence-based decision making and enable the formulation of targeted strategies to address specific difficulties in science education.

Conclusion

AI has significantly enhanced students' learning outcome by facilitating a deeper understanding of subject matter. It aids in grasping core concepts, finding optimal learning methods, and connecting topics across disciplines. Moreover, AI empowers students to integrate knowledge from diverse fields and stay updated with recent advancements. It promotes practical application of learning in real-world scenarios and provides access to a plethora of educational resources, including textbooks. Furthermore, AI plays a crucial role in fostering technological literacy among students. It enables them to utilize search engines and databases effectively for academic research, collaborate with peers on group projects

using platforms like Google Docs and Microsoft Teams, and engage in discussions on learning management systems. Additionally, AI facilitates immersive learning experiences through virtual simulations, interactive tutorials, and virtual environments, thereby enhancing students' digital skills and overall learning capabilities.

Recommendations

Based on the findings of this study, the following recommendations were made:

1. School management should integrate AI in teaching and learning in universities
2. Government should provide infrastructural facilities such as Internet and computers among others so as to support the use of AI in schools

References

Bhutoria, A. (2022). Personalized education and artificial intelligence in the United States, China, and India: A systematic review using a human-in-the-loop model. *Computers and Education: Artificial Intelligence*, *3*, 100068.

Cevikbas, M., & Kaiser, G. (2022). Promoting personalized learning in flipped classrooms: A systematic review study. *Sustainability*, *14*(18), 11393.

Cleopas, B. C. (2023). Advent of artificial intelligence: prospects and challenges in Nigeria education system. *GPH-International Journal of Educational Research*, *6*(06), 01-09.

Gwagwa, A., Kachidza, P., Siminyu, K., & Smith, M. (2021). Responsible artificial intelligence in Sub-Saharan Africa: landscape and general state of play.

Ibrahim, A. B. (2024). Assessing the Knowledge and Perception of Artificial Intelligence for Teaching and Research among Lecturers in the Faculties of Arts in Nigeria. *Journal of Global Research in Education and Social Science*, *18*(2), 25-33.

Kaledio, P., Robert, A., & Frank, L. (2024). The Impact of Artificial Intelligence on Students' Learning Experience. *Available at SSRN 4716747*.

Khalil, M., Prinsloo, P., & Slade, S. (2021). Realising the potential of learning analytics: Reflections from a pandemic. In *Online learning analytics* (pp. 79-94). Auerbach Publications.

Mahendra, S. (2023). How is AI Being Used in Education. Available at https://www.aiplusinfo.com/blog/how-is-ai-being-used-in-education/,

Mureșan, M. (2023, June). Impact of Artificial Intelligence on Education. In *Proceedings of the 32nd International RAIS Conference on Social Sciences and Humanities* (pp. 81-85). Scientia Moralitas Research Institute.

Nwadinobi, V. N., Etele, V. A., Ezebube, N. C., Monyei, F. E., & Ukpere, W. I. (2024). The Impact Of Artificial Intelligence On Undergraduates' Effectiveness In Institutions Of Higher Learning. *Educational Administration: Theory and Practice*, *30*(4), 6989-6996.

Obi, M. N. (2022). Ethical considerations in the use of artificial intelligence in Nigerian Education. *Ethics in Education Quarterly*, 38(1), 45-62.

Okunade, A. I. (2024). The Role of Artificial Intelligence in Teaching of Science Education in Secondary Schools in Nigeria. *European Journal of Computer Science and Information Technology*, *12*(1), 57-67.

Onyema, E. M. (2020). Integration of emerging technologies in teaching and learning process in Nigeria: the challenges. *Central Asian Journal of Mathematical Theory and Computer Sciences*, *1*(11), 35-39.

Qiong Z. L. & Lihong Y. Hsiao-Chin (2023). The influence of ai-powered adaptive learning platforms on student performance in Chinese classrooms. Stratford Peer Reviewed Journals and Book Publishing Journal of Education

Robinson, R. N. (2018). Artificial intelligence: its importance, challenges and applications in Nigeria. *J Eng Info Technol*, *5*(5), 36-41.

Smith, J. R. (2018). The impact of intelligent tutoring systems on student learning outcomes: A meta-analysis. *Educational Psychology Review*, 28(4), 523-548Soma, D. (2018). Artificial intelligence for education

Timothy, K. N., & Onyeukwu, H. C. (2023). Integrating Artificial Intelligent in Nigeria Education. A Panacea to Educational Assessment Development in Nigeria. *African Journal of Economics and Management Research*, *1*(2).

United Nations Educational, Scientific and Cultural Organization [UNESCO] (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development. Available at: https://www.gcedclearinghouse.org/sites/default/files/resources/190175eng.pdf