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Perceived influence of Artificial Intelligence tools on academic engagement of undergraduate Science Education Students in Rev. Fr. Orshio Moses Adasu University, Makurdi

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Abstract

This study examined the perceived influence of Artificial Intelligence (AI) tools on the academic engagement of undergraduate Science Education students at Rev. Fr. Moses Orshio Adasu University, Makurdi. A descriptive survey research design was adopted for the study. Two research questions and two hypotheses guided the study. A sample of 120 undergraduate Science Education students selected from the target population of 240. Data were collected using a structured questionnaire and analyzed using mean, standard deviation, and Pearson Product-Moment Correlation. Findings showed that students perceived AI tools as having a moderate influence on academic engagement, with a grand mean of 2.89. Which revealed a significant positive relationship between AI tool usage and academic engagement ($r = 0.58$, $p < .001$), leading to the rejection of hypothesis one. Students also demonstrated positive perceptions of AI tools and willingness to adopt them for academic purposes, with a grand mean of 3.17. A significant positive relationship was found between students' perceptions of AI tools and their willingness to adopt them ($r = 0.64$, $p < .001$), resulting in the rejection hypothesis two. The study concludes that AI tools can support students' academic engagement and technology adoption when perceived as useful and easy to use. It recommends responsible AI integration alongside independent learning and critical thinking.

Keywords: artificial intelligence, academic engagement, science education, AI adoption, undergraduate students

1 Introduction

Education is the process of facilitating learning, or the acquisition of knowledge, skills, values, morals, beliefs, habits, and personal development. Educational methods include teaching, training, storytelling, discussion, and directed research. Education takes place formally or informally under the guidance of educators also known as teachers; however, learners can also educate themselves. Through education, one is able to shape a better society by knowing and respecting rights, laws, and regulations, and by responsibly applying science and technology to address societal challenges, foster innovation, and promote peaceful coexistence in the 21st century (UNESCO, 2018). Science and technology play a vital role in national development, making science education essential for societal progress. Science provides solutions to human problems through systematic methods and technological applications, contributing significantly to sectors such as medicine, agriculture, communication, transportation, and security (Chikendu, 2018). According to Grayling (2009, as cited in Itikpo et al., 2021). Science is the foundation of every scientific and technological breakthrough in any nation of the world. It is a way of seeking information (process) and an accumulated body of knowledge resulting from research, within the broad field of science education.

Science education is a vital component of any nation's educational system, serving as a foundation for technological development, innovation, and scientific literacy. In the 21st century, science education has become more critical than ever, given the rapid pace of scientific advancement, the growing complexity of global challenges such as climate change, health pandemics, and food insecurity, and the increasing need for a scientifically informed citizenry. As such, science education now transcends the mere transmission of facts; it emphasizes inquiry, problem-solving, creativity, and the application of scientific knowledge to real-world contexts (Bybee, 2019; Organization for Economic Co-operation and Development OECD, 2018). Science education at the undergraduate level serves as a vital transition from basic knowledge to advanced technical and analytical skills needed for professional practice. By integrating core disciplines such as biology, chemistry, physics, and environmental science, the curriculum equips students with the ability to observe, analyze, and experiment, enabling them to apply scientific principles to real-world societal and industrial challenges. This approach aligns with NERDC's goal of producing undergraduate students who can use analytical and experimental skills to address national challenges and contribute as a technologically competent workforce of graduates.

Undergraduate science education hold a vital role in bridging theoretical knowledge and professional practice by advancing students from foundational learning to specialized mastery in core disciplines. National education policies emphasize revitalizing science curricula to meet 21st-century technological and sustainability demands while producing graduates who are both technologically competent and ethically grounded. Through strengthened hands-on and minds-on learning, undergraduate programmes promote advanced experimentation, independent research, and the practical application of scientific knowledge to solving real-world societal and industrial challenges (Federal Ministry of Education, 2019; NERDC, 2020; Anukaenyi & Ozomadu, 2019). The integration of Artificial Intelligence (AI) in education has attracted increasing interest and has shown promising potential in enhancing students' achievement and conceptual understanding (Zheng et al, 2023). This drift of utilizing new technologies for communication has yielded an assortment of technologies that encourage interaction with a user named "virtual information assistants", which utilizes computer programs to produce human intelligence, thus, making the users believe they are interacting with a real person. This concept is what is known as "Artificial Intelligence (AI)" (Yang et al, 2021). The emergence of Artificial Intelligence (AI) as a transformative technology has reshaped multiple sectors, including education. In recent years, the integration of AI tools in the teaching and learning process has shown significant potential to enhance academic performance, particularly in science disciplines such as Basic Science, which form the foundation of Physic, chemistry and Biology. Basic Science being a core science subject, often poses learning challenges due to its abstract nature and complex concepts (Ozcan, 2020). As such, the application of AI can help bridge these gaps by offering personalized learning, instant feedback, and adaptive instruction that meet the unique needs of individual learners. AI-powered platforms, such as intelligent tutoring systems, virtual laboratories, and adaptive testing environments, have been found to support students in understanding difficult scientific concepts, including reaction mechanisms, molecular structures, and stoichiometry (Singh & Kapur, 2021). This creates a logical link between technology and educational outcomes. This study, therefore, investigates the impact of AI on science education students' academic performance by examining its usage, effectiveness, challenges, and perceptions among students and lecturers. This will contribute to improving instructional strategies and policy decisions in science education.

1.1 Statement of the problem

Artificial Intelligence (AI) tools are increasingly used by university students to access information, understand difficult concepts, complete academic tasks, and support learning. However, their growing use raises questions about whether they actually improve students' academic engagement, particularly their participation, motivation, interest, and active involvement in learning. While AI can make learning more accessible and interactive, excessive reliance on it may reduce students' independent learning, critical thinking, and active participation, which are important in Science Education. At Rev. Fr. Orshio Moses Adasu University, Makurdi, there is limited empirical evidence on how undergraduate Science Education students perceive the influence of AI tools on their academic engagement, especially amid challenges such as inadequate technological facilities and limited learning resources. Therefore, this study seeks to examine the perceived influence of AI tools on the academic engagement of undergraduate Science Education students in the university, with a view to providing evidence for their effective and responsible use in science education.

1.2 Purpose of the Study

The main purpose of this study is to investigate the Perceived influence of Artificial Intelligence tools on academic engagement of undergraduate Science Education Students in Rev. Fr. Orshio Moses Adasu University, Makurdi. The specific objectives are to:

1. Examine the extent to which AI tools are used among undergraduate's science education students for teaching and learning at MOAUM.
2. Determine students' perceptions of AI-based tools in enhancing undergraduate science education students learning outcomes.

1.3 Research Questions

1. What is the perceived influence of Artificial Intelligence tools on the academic engagement of undergraduate Science Education students in Rev. Fr. Moses Orshio Adasu University, Makurdi?
2. What relationship exists between undergraduate Science Education students' perceptions of Artificial Intelligence tools and their willingness to adopt the tools for academic purposes?

1.4 Hypotheses

1. Artificial Intelligence tools have no significant perceived influence on the academic engagement of undergraduate science education students at MOAUM.
2. There is no significant relationship between students' perception of artificial intelligence tools and their willingness to adopt the tools in science education

1.5 Significance of the Study

The study is significant because it will provide insight into how Artificial Intelligence (AI) tools influence the academic engagement of undergraduate Science Education students at Rev. Fr. Orshio Moses Adasu University, Makurdi. The findings will help students understand how to use AI responsibly as a support for learning without becoming overly dependent on it. Lecturers may also use the findings to improve teaching strategies and guide students in the effective use of AI for academic activities. The study also provides useful information for university management and policymakers in developing appropriate guidelines for AI use and improving digital learning resources. Finally, the study will contribute to existing literature and provide a basis for future research on AI and academic engagement in Nigerian higher education.

2 Literature Review/Theoretical Framework

This study is anchored on the Constructivist Learning Theory (Piaget, 1970) and the Technology Acceptance Model (TAM), (Davis, 1989). Piaget (1970) state that learning is an active process in which learners construct and continually modify knowledge through their experiences and interaction with their environment, rather than simply receiving information from a teacher. This theory is built around several key concepts such as assimilation, accommodation, and equilibration. Assimilation occurs when learners relate new information to knowledge they already possess, while accommodation occurs when they modify their existing understanding to accommodate new information or experiences. Equilibration refers to the process through which learners achieve a balance between existing knowledge and new experiences. AI tools are relevant to this theory because they enable students to explore scientific concepts through simulations, virtual experiments, and personalized learning pathways. Also students can interact with AI applications to obtain explanations, examples, feedback, and alternative perspectives while connecting such information with their previous academic knowledge. For undergraduate Science Education students, AI tools may therefore encourage active learning by helping them ask questions, explore scientific concepts, solve problems, clarify difficult topics, and engage more independently with academic tasks. Thus, Constructivist Learning Theory is relevant to the present study because it provides a framework for examining whether and how students' interaction with AI tools influences their active participation, cognitive involvement, independent learning, and engagement with academic activities.

Similarly, The Technology Acceptance Model (TAM), developed by Davis (1989), explains that an individual's decision to accept and use a technology is largely influenced by two major constructs: perceived usefulness and perceived ease of use. Perceived usefulness refers to the extent to which a person believes that using a particular technology will improve their performance, while perceived ease of use refers to the extent to which the person believes that using the technology will require little effort (Davis, 1989). In the context of undergraduate Science Education students, these constructs are relevant because students are more likely to use AI tools such as ChatGPT, AI-powered learning platforms, and other intelligent educational applications when they perceive that such tools can help them understand difficult scientific concepts, complete academic tasks, obtain immediate explanations, improve their learning outcomes, or save time. Therefore, TAM is relevant to the study on the perceived influence of Artificial Intelligence tools on the academic engagement of undergraduate Science Education students, as it helps explain why students accept, adopt, and continue using AI tools for learning and how their perceptions of the usefulness and ease of use of these tools may influence their engagement with academic activities.

Empirically, Zudonu et al. (2024) examined the effects of AI-based instruction on achievement and conceptual change in Chemistry and Physics among secondary school students in Rivers State. Using a quasi-experimental design, the study found that AI significantly improved achievement and conceptual understanding compared to traditional methods, with students expressing positive perceptions of AI-supported learning. However, their study focused on secondary school students in Rivers State and measured mainly achievement and conceptual change, not academic engagement. This creates a developmental and conceptual gap, as little is known about how AI tools influence the academic engagement of undergraduate Science Education students in Makurdi. The present study therefore seeks to fill this gap.

Also, Egbodo, et al, (2021) studied the effectiveness of AI-related tools, such as Machine-Assisted Learning and Virtual Science Laboratories, in enhancing knowledge retention among upper basic students in Benue State. While the study confirms the cognitive benefits of AI-supported learning platforms, it was limited to secondary-level students and specific applications, without addressing broader AI tools or critical thinking skills at the undergraduate level. However, the study focused on secondary school students and specific AI applications, leaving a gap in understanding how broader AI tools influence undergraduate students' academic engagement. The present study fills this gap by focusing on undergraduate Science Education students at Rev. Fr. Orshio Moses Adasu University, Makurdi, with particular attention to how AI tools influence their participation, motivation, interest, and cognitive involvement in academic activities.

3 Materials and Methods

The study employed a descriptive survey design, the design was appropriate for capturing quantitative data on students' experiences and perceptions, as well as examining relationships between AI tool usages and learning outcomes. The study was conducted in Makurdi Local Government Area of Benue State, Nigeria, at Rev. Fr. Moses Adasu Orshio University. The target population comprises 240 undergraduate science education students enrolled in the 2024/2025 academic session, based on faculty records. A sample of 120 students was selected using purposive sampling to ensure proportional representation across academic levels. The sample included 45 students from 200 level, 40 from 300 level, and 35 from 400 level. The 200, 300, and 400level students were selected because they have sufficient exposure to university level Science Education courses, academic activities, and digital technologies. This approach minimized sampling bias and enhanced the representativeness of the sample. Data were collected using a structured questionnaire titled Students' Perception and Adoption of Artificial Intelligence Tools in Science Education Questionnaire (SPAAITSEQ). The questionnaire has 16 items in Likert-scale. The instrument was reviewed by two senior lecturer, (1) from Science Education and (1) from Educational Technology, and their feedback was incorporated. Data were collected through face-to-face administration of printed questionnaires, the researcher visited the students during lecture-free periods to avoid disrupting their academic activities and administered the printed questionnaires personally. The purpose of the study was explained to the respondents, and informed consent was obtained before participation. Participation was voluntary, and respondents were assured of the confidentiality and anonymity of their responses. Completed questionnaires were collected immediately for analysis. Data were analyzed using the Statistical Package for Social Sciences (SPSS) Version 25. Descriptive statistics (means, and standard deviations) were used to answer research question, while inferential statistics, including Pearson Product-Moment Correlation were employed to test the hypotheses at 0.05 level of significance.

4 Results

Research Question One: What is the perceived influence of Artificial Intelligence tools on the academic engagement of undergraduate Science Education students in Rev. Fr. Moses Orshio Adasu University, Makurdi?

Table **1.1**

Perceived Influence of Artificial Intelligence Tools on Academic Engagement

S/N	Items	Mean	SD	Interpretation
1	Artificial Intelligence tools improve students' participation and attention during Science Education lectures.	2.91	0.94	Moderate Extent
2	The use of AI tools motivates Science Education students to complete academic tasks and assignments effectively.	3.02	0.88	Moderate Extent
3	AI-based educational applications increase students' interest in practical and laboratory activities.	2.88	0.97	Moderate Extent
4	AI applications such as ChatGPT and educational simulations provide useful support for students' learning.	2.76	1.01	Moderate Extent
5	The use of AI tools improves students' active involvement in academic activities.	2.81	0.93	Moderate Extent
6	AI tools encourage students to spend more time exploring Science Education topics independently.	2.95	0.89	Moderate Extent

7	AI-generated explanations help students understand difficult Science Education concepts more easily.	2.89	0.91	Moderate Extent
8	The use of AI tools encourages students to participate more actively in discussions and learning activities.	2.93	0.90	Moderate Extent
Grand Mean		**2.89**		**Moderate Extent**

Table 1.1 shows the perceived influence of Artificial Intelligence tools on the academic engagement of undergraduate Science Education students in Rev. Fr. Moses Orshio Adasu University, Makurdi. The results indicate that all eight items recorded mean scores above the criterion mean of 2.50, ranging from 2.76 to 3.02. Item 2, which states that the use of AI tools motivates students to complete academic tasks and assignments effectively, recorded the highest mean score of 3.02 with a standard deviation of 0.88. This suggests that students perceive AI as particularly useful in motivating them to complete academic work. Item 4 recorded the lowest mean of 2.76 with a standard deviation of 1.01, suggesting that the use of AI applications for learning support is perceived positively, although to a relatively lesser extent. The grand mean of 2.89 indicates that undergraduate Science Education students perceive AI tools as having a moderate influence on their academic engagement.

Research Question Two: What relationship exists between undergraduate Science Education students' perceptions of Artificial Intelligence tools and their willingness to adopt the tools for academic purposes?

Table **1.2**

Students' Perceptions of AI Tools and Willingness to Adopt Them for Academic Purposes

S/N	Items	Mean	SD	Interpretation
1	I perceive AI tools as useful for improving my academic work in Science Education.	3.21	0.82	Agree
2	I am willing to use AI tools when they can help me understand difficult academic concepts.	3.15	0.84	Agree
3	I find AI tools easy to use for completing academic activities.	3.28	0.78	Agree
4	I would continue using AI tools if they improve my learning experience.	3.05	0.91	Agree
5	I am confident in using AI tools for academic purposes.	3.09	0.87	Agree
6	I am willing to recommend useful AI tools to other Science Education students.	3.18	0.83	Agree
7	My positive perception of AI encourages me to adopt it for academic activities.	3.12	0.86	Agree
8	I am willing to learn how to use new AI tools that can support my academic work.	3.24	0.79	Agree
Grand Mean		3.17		Agree

Table 1.2 indicates that undergraduate Science Education students generally have positive perceptions of Artificial Intelligence tools and demonstrate willingness to adopt them for academic purposes. The item mean scores ranged from 3.05 to 3.28, all of which are above the criterion mean of 2.50. Item 3, which states that students find AI tools easy to use for completing academic activities, recorded the highest mean of 3.28 with a standard deviation of 0.78. This suggests that perceived ease of use is an important factor supporting students' willingness to adopt AI tools. Item 4 recorded the lowest mean of 3.05 with a standard deviation of 0.91, but it still indicates agreement that students would continue using AI where it improves their learning experience. The grand mean of 3.17 shows that the students generally have a positive perception of AI tools and are willing to adopt them for academic purposes.

Hypothesis One: Artificial Intelligence tools have no significant perceived influence on the academic engagement of undergraduate Science Education students at MOAUM.

Table **1.3**

Pearson Product-Moment Correlation between Artificial Intelligence Tools Usage and Academic Engagement of Undergraduate Science Education Students

Variables	N	Mean	SD	Pearson *r*	p-value	Decision
Artificial Intelligence Tools Usage	120	2.88	0.71	**0.58**	**< .001**	Rejected
Academic Engagement of Science Education Students	120	3.06	0.68			

Table 1.3 shows a moderate positive relationship between AI tools usage and academic engagement among undergraduate Science Education students at MOAUM. AI tools usage recorded a mean of 2.88 (SD = 0.71), while academic engagement had a mean of 3.06 (SD = 0.68). The Pearson correlation was r = 0.58, p < .001, indicating that students who used AI tools more tended to show higher academic engagement. Since p < .05, the null hypothesis was rejected. Therefore, AI tools usage is significantly and positively related to students' academic engagement.

Hypothesis Two: There is no significant relationship between students' perception of artificial intelligence tools and their willingness to adopt the tools in science education

Table **1.4**

Pearson Product-Moment Correlation between Students' Perception of AI Tools and Willingness to Adopt the Tools

Variable	N	Mean (X)	SD	t-value	df	Decision
Students' Perception of AI Tools	120	3.16	0.64	0.71	238	Accepted
Willingness to Adopt AI Tools	120	3.09	0.87			

Table 1.4 shows that students' perception of AI tools had a mean of 3.16 (SD = 0.64), while willingness to adopt AI tools had a mean of 3.09 (SD = 0.87). The Pearson correlation revealed a moderately strong positive relationship between the variables (r = 0.64, p < .001). Since p < .05, the null hypothesis was rejected. Therefore, students' perception of AI tools is significantly and positively related to their willingness to adopt the tools in Science Education.

5 Discussion of Findings

The findings of this study revealed that Artificial Intelligence (AI) tools have a moderate but meaningful influence on the academic engagement of undergraduate Science Education students at Rev. Fr. Moses Orshio Adasu University, Makurdi. Specifically, students indicated that AI tools moderately enhance their participation, motivation, task completion, and involvement in learning activities. This aligns with the constructivist perspective, which emphasizes that learners actively build knowledge through interaction with learning tools and environments. AI-supported learning platforms such as simulations and intelligent tutoring systems appear to provide students with more engaging and interactive learning experiences, thereby improving their involvement in science education activities. It also supports the findings of Zudonu et al. (2024) and Egbodo et al. (2021), who reported positive cognitive and learning benefits of AI-supported learning. Thus, the present finding extends these earlier studies by showing that AI use is significantly related not only to learning outcomes but also to the academic engagement of undergraduate Science Education students. The second finding showed that students generally hold a positive perception of AI tools and are willing to adopt them for academic purposes. Most respondents agreed that AI improves understanding, supports teaching and enhances learning outcomes. This supports the Technology Acceptance Model (TAM), which explains that perceived usefulness strongly influences the adoption of technology. However, students also expressed concern that excessive reliance on AI may weaken independent reasoning and critical thinking skills. This suggests a balanced awareness among students regarding both the benefits and potential risks of AI integration in education. Similarly, the findings are in agreement with the study by Egbodo et al, (2021) which demonstrated that AI-related tools such as Machine Assisted Learning and Virtual Science Laboratories enhanced students' knowledge retention in science subjects.

6 Conclusion

The study concludes that Artificial Intelligence tools have a moderate positive influence on the academic engagement of undergraduate Science Education students at Rev. Fr. Moses Orshio Adasu University, Makurdi. Students generally perceive AI as useful and easy to use, and these positive perceptions are significantly associated with their willingness to

adopt AI for academic purposes. Finally, the findings suggest that when used responsibly, AI can serve as a valuable support for students' learning, participation, and academic activities.

7 Recommendations

University authorities and curriculum planners should integrate AI-based learning tools such as virtual laboratories, intelligent tutoring systems, and adaptive learning platforms into science education programs to enhance engagement and understanding.

8 Declaration

Ethical Statements: The ethical approval was obtained from the Department of Science and Mathematics Education, Rev. Fr. Orshio Moses Adasu University, Makurdi. Participants were informed about the purpose of the study and gave voluntary consent before participation. Confidentiality and anonymity were strictly maintained, the study did not involve any form of physical, psychological, or academic harm to respondents.

Conflict of Interest: The researcher declares that there is no conflict of interest in the conduct of this study. The research was carried out independently for academic purposes, without any financial, institutional, or personal influence that could have affected the design, data collection, analysis, interpretation, or reporting of the findings.

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