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Perceived Impact of Artificial Intelligence as a Science Education Tool for Enhancing a Change in Academic Experience

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Abstract
The study investigated the perceived impact of artificial intelligence as a science education tool for enhancing academic experience. A descriptive design was used to gather data. One hundred and forty-seven (147) respondents, comprising twenty-one students each, which was randomly selected from seven departments in the School of Secondary Education (Science Programmes), Federal College of Education (Special), using proportionate stratified random sampling. Three research questions guided the study. A structured questionnaire, with a reliability coefficient of 0.659, established through a pilot test using the Cronbach Alpha technique, was the instrument used to draw information from the respondents. Data collected were analysed using descriptive statistics of frequency counts, percentages, and mean, and a mean of 2.50 was taken as the minimum acceptable mean score. The results showed that there is a modest level of AI integration in science education in schools, a favourable perception of this integration, and several obstacles to overcome in its use. It is concluded that although there is no proper integration of artificial intelligence, it is seen as a very effective science education tool for enhancing academic experience, also there is a positive student opinion about the integration of AI in science education. It was recommended that lecturers should encourage their students to use AI, that there be sufficient resources for AI tools, and that educators and institutions incorporate AI technologies into teaching and learning.
Keywords: Artificial Intelligence, Academic Experience, and Science Education

Introduction

Science education aims to create a scientifically literate public that can use science to reason and make decisions. This supports the "Science for All" movement, which highlights the value of science education for all students, not only those who want to work in the scientific field. The teaching and understanding of scientific theories, methods, and experiments in science education help students build their scientific literacy and critical thinking skills. Science education is vital

for developing students' critical thinking skills, problem-solving ability, and scientific literacy (Afnan, Munasir, Budiyanto, and Aulia, 2023). It is critical for instilling interest in STEM (Science, Technology, Engineering, and Mathematics) subjects and preparing pupils for future professions in science-related businesses (Kola, 2013; Almasri, 2021; Holme, 2021)

The ability of a digital computer or computer-controlled robot to carry out actions often associated with intelligent beings is known as artificial intelligence (AI). The phrase is commonly used to describe the endeavour of creating artificial intelligence systems that include human-like cognitive functions, like reasoning, meaning-finding, generalization, and experience-based learning (Copeland, 2024). AI technologies provide novel methods to improve teaching and learning experiences. AI in science education can offer students personalized learning possibilities, interactive simulations, virtual laboratories, intelligent tutoring systems, and real-time feedback. The integration of artificial intelligence (AI) in education has resulted in substantial changes in instructional methodologies, curriculum design, and student participation in the digital age (Kamalov, Santandreu, Calonge, and Gurrib, 2023). Artificial intelligence (AI) is a technological development that has had a significant impact in this field. The rapid progress of AI-driven solutions opens up several opportunities for society and education. Artificial intelligence can automate a variety of time-consuming and repetitive tasks in the workplace, increasing efficiency and production. Individualized learning options in the classroom assist pupils while also allowing teachers to adopt cutting-edge teaching tactics (García-Martínez, Fernández-Batanero, Fernández-Cerero, and Leon, 2023). Integration of artificial intelligence (AI) into science education is becoming a common approach, it has significantly transformed teaching and learning methods, hence becoming a powerful tool (Costa, Fonseca, Santana, Araújo, and Rego, 2017).

This study makes several contributions to the literature on AI in science education. First, by offering a more sophisticated knowledge of how AI is

incorporated into educational settings, particularly in science classrooms, it aids in bridging the gap between theoretical benefits and actual real-world implementation. It adds to the expanding corpus of research on the variables influencing the adoption of AI in schools by examining attitudes toward AI technologies in scientific education. It fosters personalized learning and engagement. Lastly, this study adds to the body of research on the connection between academic achievement and AI use, highlighting whether or not AI technologies can improve learning results.

A study that investigated the impact of AI technologies on students' learning processes and academic performance, with a focus on their perceptions and the challenges associated with AI adoption, showed that it has many advantages, such as better academic results, more individualized instruction, and increased student involvement. But there are drawbacks as well, like an over-dependence on AI, a decline in critical thinking abilities, data privacy issues, and academic dishonesty (Vieriu and Petrea, 2025). Another study investigated the awareness and utilization of Artificial Intelligence (AI) in teaching and learning among secondary school students in Afijio Local Government, Oyo State and the findings of the study revealed that the Biology students are not aware of the existence of Artificial Intelligence tools used in teaching and learning, and are also not utilizing AI tools in teaching and learning (Oyawole, Agada, Oladipupo, and Okunlola, 2025). Also, a systematic review that explored the Impact of Artificial Intelligence in Teaching and Learning of Science, rendering an inherent understanding of the evidence-based interaction between AI and science education showed that the integration of AI-powered technologies into science education enhances the learning environment, creates quizzes, evaluates student work, and predicts students' academic achievement, among other pedagogical benefits (Almasri, 2024).

Even though interest in AI in education is growing, more thorough research is needed to determine its impact on enhancing change in academic experience, especially in the field of science education. This study, therefore, examines artificial intelligence as a science education tool for enhancing academic experience.

Incorporating AI tools into science education will help in investigating how technologies influence students' academic performance. This includes checking the opinion of students about the changes caused by the integration of AI in science education and identifying the challenges and benefits associated with integrating AI into science classrooms.

Statement of the Problem

Globally, the use of artificial intelligence (AI) tools in education has revolutionised the teaching and learning process by opening up new avenues for data-driven instruction, interactive material delivery, and personalised learning. Despite these developments, there is rising concern that college students are not sufficiently aware of the use of AI tools in their education. The successful implementation of AI technologies in classrooms is hampered in many institutions, particularly in developing nations, by issues like poor infrastructure, a lack of training on the use of AI tools, restricted access to AI resources, and a lack of transparency in AI decision-making. Furthermore, it is uncertain how well-equipped students are in the use of AI to improve learning outcomes, hence the need to examine the perceived impacts of artificial intelligence as a science education tool to improve academic experience is highlighted by this gap, as understanding how AI influences learning outcomes in science subjects is crucial for educators and policymakers to enhance teaching methodologies and student achievement.

Objectives of the Study

1. To determine the extent to which AI has been integrated into science education.
2. To know the opinion of students about the changes caused by the integration of AI in science education.
3. To identify the challenges and benefits associated with integrating AI into science classrooms.

Research Questions

1. What is the extent of AI integration in science education?

2. What are the Students' opinions about changes caused by the integration of AI in science education?
3. What are the main challenges faced when implementing AI in science education?

Methods

This study employed a descriptive design to gather data on the current utilization of artificial intelligence in science education and its impact on academic performance among students from different levels and departments. The population comprised twenty-one (21) students each, randomly selected from seven departments in the School of Secondary Education (Science Programmes), Federal College of Education (Special), making one hundred and forty-seven (147) respondents. Proportionate stratified random sampling was used for the selection of students in the departments to ensure proportional representation from each department and level. The seven departments include biology, chemistry, computer science, integrated science, mathematics, physics, and physical health education (PHE).

The instrument used for data collection in this study was a structured questionnaire constructed using insights from previous studies and is specifically designed to investigate the perceived impact of artificial intelligence as a science education tool for enhancing academic experience. The validity of the instrument was partly established through careful examination of the questionnaire items about the research problem and objectives of the study, and subsequently submitted for scrutiny to experts in artificial intelligence and educational research fields to ensure its relevance and reliability for measuring the intended constructs accurately. The reliability of the instrument was established through a pilot test using the Cronbach Alpha technique and was 0.659. This was an indication that the questionnaire is within the acceptable threshold in natural sciences and is fit to be used to gather data for the present study. The measurement instrument comprised a scale of 25 items, employing a 4-point Likert scale. The available response options on this scale

encompassed a variety of opinions, starting with "strongly disagree" (1) and extending to "Strongly agree" (4). Data collected from the respondents were analyzed using descriptive statistics of frequency counts, percentages, and mean. Frequency counts and percentages were used to analyze the respondents' demographic data. Descriptive statistics of percentage and mean based on the four-point scale, namely strongly agreed (SA) = 4, Agreed (A) = 3, Disagreed (D) = 2, and Strongly Disagreed (SD) = 1, was used to analyze the extent of students' engagement with artificial intelligence, students' opinions about AI integration in science education, and challenges of AI implementation. These approaches encompass mean, standard deviation, frequency, and percentage measurements. A mean of 2.50 was taken as the minimum acceptable mean score. A mean of 2.50 and above is regarded as accepted, while any item with a mean less than 2.50 is regarded as rejected.

Results and Findings

Analysis of Data and Presentation of Results

Frequency Distribution of the Demographic Data of Respondents

Table 1: Respondents' Demographic Data (n = 147)

Demographic Variables	Frequency (F)	Percentage (%)
Gender		
Male	67	46
Female	80	54
Total	**147**	**100**

Source: Fieldwork, 2024

Table 1 shows that 27(18%) of the respondents are below 16 years old, 82(56%) of the respondents are between 16-20 years old, and 38(26%) of the respondents are above 20 years old. Furthermore, 67(46%) of the respondents are male while 80(54%) are females. This shows that there are more female respondents than males.

Research Question 1: What is the extent of AI integration into science education?

Table 2: Frequency, Mean, and standard deviation describing the extent of AI integration in science education.

Items	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	SD
AI technology has been effectively integratec into science education at the Federal College of Education (Special), Oyo.	25 (17.0%)	27 (18.4%)	37 (25.2%)	58 (39.5%)	2.13	1.118
All lecturers in my department employ the use of AI technology in teaching.	22 (15.0%)	32 (21.8%)	35 (23.8%)	58 (39.5%)	2.12	1.097
Students have access to AI tools and information that can help in research.	53 (36.1%)	45 (30.6%)	20 (13.6%)	29 (19.7%)	2.83	1.125
AI is frequently mentioned and stressed in programs.	36 (24.5%)	32 (21.8%)	34 (23.1%)	45 (30.6%)	2.40	1.163
My engagement with AI has improved over the years.	72 (49.0%)	24 (16.3%)	18 (12.2%)	33 (22.4%)	2.92	1.230

Source: Researcher's Field Survey 2024)

Table 2 showed that 25 students, equivalently 17.0% of the respondents strongly agreed, 27(18.4%) agreed that AI technology has been effectively integrated into science education at the Federal College of Education (Special), Oyo, while 37 students, equivalently 25.2% of the respondents disagreed and 58 (39.5%) strongly disagreed that AI technology has been effectively integrated into science education at the Federal College of Education (Special). Also, from the weighted mean (M = 2.13), which is less than the decision mean, which is 2.50, the statement that "AI technology has been effectively integrated into science education at the Federal College of Education (Special), Oyo" was rejected. This opined that AI technology has not been effectively integrated into science education at the Federal College of Education (Special), Oyo.

Table 2 also showed that 22 students, equivalently 15.0% of the respondents strongly agreed, 32(21.8%) agreed that all lecturers in the department employ the use of AI technology in teaching, while 35 students, equivalently 23.8% of the respondents disagreed and 58 (39.5%) strongly disagreed that all lecturers in the department employ the use of AI technology in teaching. Also, from the weighted

mean (M = 2.12), which is less than the decision mean which is 2.50, the statement that "all lecturers in the department employ the use of AI technology in teaching" was rejected. This opined that not all lecturers in the department employ the use of AI technology in teaching.

It also showed that 53 students, equivalently 36.1% of the respondents strongly agreed, and 45(30.6%) agreed that students have access to AI tools and information that can help in research, while 20 students, equivalently 13.6% of the respondents disagreed and 29 (19.7%) strongly disagreed that students have access to AI tools and information that can help in research. Also, from the weighted mean (M = 2.83), which is greater than the decision mean, which is 2.50, the statement that "students have access to AI tools and information that can help in research" was accepted. This opined that students have access to AI tools and information that can help in research.

It also showed that 36 students, equivalently24.5% of the respondents strongly agreed, and 32(21.8%) agreed that AI is frequently mentioned and stressed in programs, while 34 students, equivalently 23.1% of the respondents disagreed and 45 (30.6%) strongly disagreed that AI is frequently mentioned and stressed in programs. Also, from the weighted mean (M = 2.40), which is less than the decision mean, which is 2.50, the statement that "AI is frequently mentioned and stressed in programs" was rejected. This opined that AI is not frequently mentioned and stressed in programs.

Lastly, it also showed that 72 students, equivalently 49.0% of the respondents strongly agreed, and 24 (16.3%) agreed that their engagement with AI has improved over the years, while 18 students, equivalently 12.2% of the respondents disagreed and 33 (22.4%) strongly disagreed that their engagement with AI has improved over the years. Also, from the weighted mean (M = 2.92), which is greater than the decision mean, which is 2.50, the statement that "my engagement with AI has improved over the years" was accepted. This opined that students' engagement with the use of AI has improved over the years.

Table 2 indicates generally negative results, showing that the extent to which AI is integrated in science education in schools is moderate.

Research Question 2: What are the Students' opinions about changes caused by the integration of AI in science education?

Table 3: Frequency, Mean, and standard deviation describing the Students' opinion about AI integration in science education.

Students' opinions about AI integration in science education.	Strongly Agree	Strongly	Disagree	Strongly Disagree	Mean	SD
AI integration in science education has improved student engagement	75 (51.0%)	43 (29.3%)	7 (4.8%)	22 (15.0%)	3.16	1.067
AI integration in science education has improved personalized learning experiences.	63 (42.9%)	45 (30.6%)	16 (10.9%)	30 (20.4%)	3.01	1.082
AI integration in science education has enhanced understanding of complex scientific concepts	59 (40.1%)	42 (28.6%)	16 (10.9%)	30 (20.4%)	2.88	1.150
AI enhances creativity and critical thinking skills in students	57 (38.8%)	40 (27.2%)	16 (10.9%)	34 (23.1%)	2.82	1.182
AI helps in reducing educational inequalities	83 (56.5%)	46 (31.3)	6 (4.1%)	12 (8.2%)	3.36	0.899

Source: Researcher's Field Survey 2024)

Table 3 showed that 75 students, equivalently 51.0% of the respondents strongly agreed, 43 (29.3%) agreed that AI integration in science education has improved student engagement, while 7 students, equivalently 4.8% of the respondents, disagreed, and 22 (15.0%) strongly disagreed that AI integration in science education has improved student engagement. Also, from the weighted mean (M = 3.16), which is greater than the decision mean, which is 2.50, the statement that "AI integration in science education has improved student engagement" was accepted. This opined that AI integration in science education has improved student engagement.

It revealed that 63 students, equivalently 42.9% of the respondents strongly agreed, 45 (30.6%) agreed that AI integration in science education has improved personalized learning experiences, while 16 students, equivalently 10.9% of the

respondents disagreed and 30 (20.4%) strongly disagreed that AI integration in science education has improved personalized learning experiences. Also, from the weighted mean (M = 3.01), which is greater than the decision mean which is 2.50, the statement that "AI integration in science education has improved personalized learning experiences" was accepted. This opined that AI integration in science education has improved personalized learning experiences.

It also revealed that 59 students, equivalently 40.1% of the respondents strongly agreed, 42 (28.6%) agreed that AI integration in science education has enhanced understanding of complex scientific concepts, while 16 students, equivalently 10.9% of the respondents disagreed and 30 (20.4%) strongly disagreed that AI integration in science education has enhanced understanding of complex scientific concepts. Also, from the weighted mean (M =2.88), which is greater than the decision mean, which is 2.50, the statement that "AI integration in science education has enhanced understanding of complex scientific concepts" was accepted. This opined that AI integration in science education has enhanced the understanding of complex scientific concepts.

It showed that that 57 students, equivalently 38.8% of the respondents strongly agreed, 40 (27.2%) agreed that AI enhances creativity and critical thinking skills in students, while 16 students, equivalently 10.9% of respondents disagreed and 34 (23.1%) strongly disagreed that AI enhances creativity and critical thinking skills in students. Also, from the weighted mean (M =2.82), which is greater than the decision mean, which is 2.50, the statement that "AI enhances creativity and critical thinking skills in students" was accepted. This opined that AI enhances creativity and critical thinking skills in students.

Lastly, table 3 also showed that 83 students, equivalently 56.5% of the respondents strongly agreed, 46 (31.3%) agreed that AI helps in reducing educational inequalities, while 6 students, equivalently 4.1% of the respondents disagreed and 12 (8.2%) strongly disagreed that AI helps in reducing educational inequalities. Also, from the weighted mean (M = 3.36), which is less than the

decision mean, which is 2.50, the statement that "AI helps in reducing educational inequalities" was rejected. This opined that AI helps in reducing educational inequalities. Generally, the Table 3 results indicate a positive opinion about the integration of AI in science education.

Research Question 3: What are the main challenges faced when implementing AI in science education?

Table 4: Frequency, Mean, and standard deviation describing the challenges faced when implementing AI in science education

Challenges faced when implementing AI in science education.	Strongly Agree	Agree	Disagree	Strongly Agree	Mean	SD
Lack of training on the use of AI tools is hindering the implementation of AI in science education.	28 (19.0%)	32 (21.8%)	44 (29.9%)	48 (29.3%)	2.31	1.089
Access to AI resources is very low.	60 (40.8%)	42 (28.6%)	29 (19.7%)	16 (10.9%)	2.99	1.024
One of the challenges is student resistance to technology integration.	70 (47.6%)	29 (19.7%)	16 (10.9%)	32 (21.8%)	2.93	1.209
There is the problem of bias and discrimination in algorithms.	68 (46.3%)	37 (25.2%)	18 (12.2%)	24 (16.3%)	3.01	1.116
No data privacy and security	49 (33.3%)	49 (33.3%)	22 (15.0%)	27 (18.4%)	2.82	1.092

Source: Researcher's Field Survey 2024)

Table 4 showed that 28 students, equivalently 19.0% of the respondents strongly agreed, 32 (21.8%) agreed that lack of training on the use of AI tools is hindering the implementation of AI in science education, while 44 students, equivalently 29.9% of the respondents disagreed and 48 (29.3%) strongly disagreed that lack of training on the use of AI tools is hindering the implementation of AI in science education. Also, from the weighted mean (M = 2.31), which is less than the decision mean, which is 2.50, the statement "lack of training on the use of AI tools is hindering the implementation of AI in science education" was rejected. This opined that a lack of training on the use of AI tools is hindering the implementation of AI in science education.

It also showed that 60 students, equivalently 40.8% of the respondents strongly agreed, 42 (28.6%) agreed that the access to AI resources is very low, while 29 students, equivalently 19.7% of the respondents disagreed and 16 (10.9%)

strongly disagreed that the access to AI resources is very low. Also, from the weighted mean (M = 2.99), which is greater than the decision mean, which is 2.50, the statement that "the access to AI resources is very low" was accepted. This opined that access to AI resources is very low.

It revealed that 70 students, equivalently 47.6% of the respondents strongly agreed, 29 (19.7%) agreed that one of the challenges of AI integration to science education is student resistance to technology integration, while 16 students, equivalently 10.9% of the respondents disagreed and 32 (21.8%) strongly disagreed that one of the challenges of AI integration to science education is student resistance to technology integration. Also, from the weighted mean (M = 2.93), which is greater than the decision mean, which is 2.50, the statement that "one of the challenges of AI integration to science education is student resistance to technology integration" was accepted. This opined that one of the challenges of AI integration into science education is student resistance to technology integration.

It showed that that 68 students, equivalently 46.3% of the respondents strongly agreed, 37 (25.2%) agreed that there is a problem of bias and discrimination in algorithms while using AI, while 18 students, equivalently 12.2% of the respondents disagreed and 24 (16.3%) strongly disagreed that there is the problem of bias and discrimination in algorithms while using AI. Also, from the weighted mean (M = 3.01), which is greater than the decision mean, which is 2.50, the statement that "there is a problem of bias and discrimination in algorithms while using AI" was accepted. This opined that there is a problem of bias and discrimination in algorithms while using AI.

Lastly, table 4 also showed that 49 students, equivalently 33.3% of the respondents strongly agreed, 49 (33.3%) agreed that there is no data privacy and security in AI, while 22 students, equivalently 15.0% of the respondents disagreed and 27 (18.4%) strongly disagreed that there is no data privacy and security in AI. Also, from the weighted mean (M = 2.82), which is greater than the decision mean,

which is 2.50, the statement that "there is no data privacy and security in AI" was accepted. This opined that there is no data privacy and security in AI.

Generally, the Table 4 results indicate that the implementation of AI in science education is faced with various challenges.

Discussion of Findings

The findings of research question 1, as presented in Table 2, have shown that, despite increased student engagement and access to AI research tools, the Federal College of Education (Special), Oyo, has not successfully incorporated AI technology into science instruction because not all lecturers use it in their lessons, programs hardly ever highlight AI, and students are not encouraged to use AI applications. The result of this study is in line with the outcome of the research work of Oyawole, Agada, Oladipupo, and Okunlola (2025) which opined that the Biology students are not aware of the existence of Artificial Intelligence tools used in teaching and learning, and are also not utilizing AI tools in teaching and learning.

The findings of research question 2, as presented in Table 3, showed a positive opinion about the integration of AI in science education, highlighting that AI will play a key role in the future, increase interest in science, improve student engagement, enhance personalized learning, help students understand complex concepts, foster creativity and critical thinking, provide accurate assessments, reduce academic workload and stress, and contribute to reducing educational inequalities. This is in line with reviewed work done by Almasri (2024), which revealed that the integration of AI-powered technologies into science education enhances the learning environment, creates quizzes, evaluates student work, and predicts students' academic achievement, among other pedagogical benefits.

The findings of research question 3, as presented in Table 4, showed that the implementation of AI in science education is faced with various challenges, including difficulties in incorporating AI into coursework, lack of training on AI tools, low access to AI resources, student resistance to technology, limited human interaction, bias and discrimination in algorithms, lack of transparency in AI

decision-making, and concerns over data privacy and security. This result agrees with the findings that although AI has many advantages, such as better academic results, more individualized instruction, and increased student involvement, but there are drawbacks as well, like an over-dependence on AI, a decline in critical thinking abilities, data privacy issues, and academic dishonesty (Vieriu and Petrea, 2025).

Conclusion

With the result, it is concluded that although there is no proper integration of artificial intelligence, it is seen as a very effective science education tool for enhancing a change in academic experience, also there is a positive student opinion about the integration of AI in science education.

Recommendation

Based on the findings, several recommendations were made for the study; the following recommendations were made:

1. Lecturers should encourage the students to use Artificial Intelligence.
2. There should be adequate provisions for AI tools and information that can help in research.
3. Educators and institutions should integrate AI technologies into teaching and learning to improve academic performance, promote student engagement, and ensure effective AI integration.

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