



## **Perception and Attitude of Undergraduate Biology Education Students Towards the Integration of Artificial Intelligence Tool in Teaching and Learning of Biology**

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### **Abstract**

This study aimed to examine how undergraduate students in the Biology Education program perceive and respond to the integration of Artificial Intelligence (AI) tools in the teaching and learning of biology. A descriptive survey research design was adopted for the investigation. The study involved a total of 129 second- and third-year Biology Education students enrolled during the 2024/2025 academic session, who also served as the sample since the population size was considered manageable. Data collection was carried out using a structured questionnaire titled Questionnaire on Perception and Attitude of Undergraduate Students on AI Integration in Biology Education (QPAUSAIBE). The instrument's reliability was confirmed using Cronbach's Alpha, which produced a strong reliability coefficient of 0.87. The research questions were analysed using mean and standard deviation scores. The results indicated that students held favourable views about the use of AI tools in biology education and recognized AI's effectiveness in supporting personalized learning, enabling flexible, self-paced study, and improving overall learning experiences. Based on these findings, the study recommended, among other things, that educators should actively incorporate AI-based technologies and digital resources into biology instruction to enhance student learning outcomes.

**Keywords:** Biology, Biology Education, Artificial Intelligence, Perception, Attitude

### **Introduction**

Biology is the fascinating study of living things, from tiny cells to giant trees and humans. This science of life endeavours to comprehend the intricate web of relationships within the natural world, delving into the mysteries of existence. Biology explores the amazing diversity of life on earth, scrutinizing the structure, function, and evolution of living organisms. Green, Joshi and Rogers (2024) defined biology as the study of living things and their vital processes.

Biology, as a branch of science, plays a vital role in helping us make sense of life and how different living organisms—including humans—function, adapt, and interact with their environment. Within the school curriculum, biology stands out as a core component of the natural sciences due to its significant contribution to shaping students' understanding of life and nurturing their overall development. Given its critical role in both education and everyday life, it is essential to prepare future educators through university-level

biology programs. These trained professionals will be responsible for passing on biological knowledge to younger learners, helping to build a scientifically informed and curious generation.

Biology education is a university-level course that blends in-depth knowledge of biological sciences with foundational training in teaching methods. Students who complete this program are prepared to take on roles as biology teachers, particularly in secondary schools. Beyond being academically engaging, the field offers the meaningful opportunity to ignite students' interest in science, nurture future scientists, and play a vital role in improving scientific understanding across society.

Despite the importance of Biology, the performance of students in the subject both in secondary schools and tertiary institutions has not been encouraging. The researchers observed during the mandatory teaching practice exercises that students



found it very difficult to understand many concepts in Biology and did not do very well in the subject. Their scores in assignments, tests, and examinations were poor. This unsatisfactory performance of students in biology, both in secondary schools and tertiary institutions, according to Tata and Rabi (2014), could be due to inadequate qualified teachers and inadequate infrastructural facilities and instructional media. Modern media such as audio, video tapes, virtual laboratories, programmed texts; flashcards, computers, and AI applications are rarely used (Okeke & Ojobor, 2024). In order to improve the performance of students in Biology, it is essential to integrate Information and Communication Technology (ICT) and specifically artificial intelligence (AI) tools in teaching and learning of the subject in schools

Artificial Intelligence (AI) refers to the ability of machines—especially computers—to carry out tasks that typically require human intelligence. Rather than being just a smart program, AI is designed to mimic how people think, learn, and solve problems. According to Russell and Norvig (2021), AI broadly describes machine-based intelligence, while Chen, Jiang, Jia, and Liu (2022) explain it as a computer's capacity to perform mental tasks such as reasoning, learning, and decision-making—activities traditionally associated with human cognition. AI has made its way into everyday life through a range of powerful applications. Examples include smart search engines like Google, personalized recommendation systems used by platforms like Netflix, YouTube, and Amazon, as well as voice-activated assistants like Siri, Alexa, and Google Assistant. It also powers self-driving vehicles like Waymo and fuels creative technologies such as ChatGPT, AI-generated art, and Apple's AI tools. Additionally, AI has achieved expert-level performance in strategic games like chess and Go, outperforming even the best human players in some cases.

Several researchers have reported that educational outcomes are more effective when using artificial intelligence (AI) tools to assist teaching and learning than with traditional learning that is teacher-centered (Afolabi and Oluwatimilehin, 2021; Zhu & Ren, 2022; Olatunde-Aiyedun, 2024). This development has been recognized, and the use of AI in education is being given high priority. In recognition of the rapid changes in global technology, Nigeria's National Universities Commission (NUC) has emphasized the importance of transforming the country's higher education system to stay current with international trends (NUC, 2018). With a growing

youth population and aspirations to become a key player in the global tech space, Nigeria is pushing its universities to redesign their academic programs. This involves equipping students with the modern skills and knowledge needed to thrive in today's technology-driven world (NUC, 2020). Within this effort, science education—and biology education in particular—holds a critical position in training capable professionals who can drive national progress. Incorporating Artificial Intelligence (AI) into biology education directly supports Nigeria's broader goals of encouraging innovation, expanding research capacities, and advancing technological development (NUC, 2017).

The use of Artificial Intelligence (AI) in biology education presents exciting possibilities for enhancing every aspect of the educational experience—from teaching and learning to assessment and administration. AI can help tailor lessons to fit each student's learning pace and style, making education more personalized and effective. It also gives teachers valuable insights into how their students are progressing, allowing for better support and intervention. Additionally, AI tools can handle questions and provide instant feedback, helping learners stay engaged and correct misunderstandings in real time. An important feature of AI technology in biology education is that it can be used to customize learning materials to meet individuals' needs, thereby enabling personalized learning approaches (Chatterjee and Bhattacharjee, 2020; Bu, 2022; Olatunde-Aiyedun, 2024). AI tools are particularly beneficial for use outside the normal classroom time, as biology education students can employ them to gain answers to any questions that they may have (Alzahrani and Seth, 2021; Afolabi & Oluwatimilehin, 2021). Buttressing further, Mayer's Cognitive Theory of Multimedia Learning (CTML) (2001) postulated that people learn more effectively when information is presented in both visual and auditory forms, as opposed to one medium alone. However, proper integration of AI in teaching and learning relies much on students' attitudes towards it; thus, the need to understand students' perceptions and attitudes towards its integration in teaching and learning.

Perception refers to how individuals interpret, understand, or form opinions about something. It often reflects widely held beliefs or impressions based on how things appear to people (Cambridge Online Dictionary, 2024). In educational settings, students' views and experiences with emerging technologies like Artificial Intelligence (AI) can significantly influence

their willingness to engage with such tools. How they perceive AI, whether with enthusiasm, curiosity, or skepticism, can directly affect how much the technology is actually embraced in their learning process (Chan & Hu, 2023). Research has indicated a strong connection between how students perceive AI and how likely they are to adopt it. For instance, Kumar and Raman (2022) found that when students have a positive view of AI in educational contexts, they are more likely to support its use in teaching and learning. Learners who see AI as beneficial often demonstrate an open-minded and forward-thinking attitude, which increases the chances of meaningful integration of AI into academic environments.

Attitude describes to the collection of emotions, beliefs, and behavioural tendencies an individual holds toward a specific idea, object, or situation. As described by Albaity and Rahman (2019), attitude reflects a person's emotional response, either favourable or unfavourable, toward a particular activity. In the context of technology adoption, attitude is a crucial factor that can either support or hinder the effective use of new tools (Krishnakumar & Rajesh, 2011). As Artificial Intelligence (AI) continues to influence and reshape the educational landscape, the perspectives of both teachers and students play a key role in how smoothly and effectively AI is adopted in schools and universities (Schepman & Rodway, 2020). People's attitudes toward AI differ significantly. While many embrace its potential, others raise concerns about its risks. Some individuals question the safety and reliability of AI-powered systems and fear job displacement, or even worry about AI surpassing human control (Johnson & Verdicchio, 2017; Lichtenthaler, 2020; Sanders & Schneier, 2023).

Several studies have explored how attitude affects the reception of AI in education. For example, Eteng-Uket and Effiom (2024) studied how students at Rivers State University in Port Harcourt perceived AI-based learning tools. Their findings showed that an overwhelming 98% of the students had a favorable attitude toward the use of AI for learning and research. The study also revealed that factors such as gender and age had no significant impact on these attitudes. Likewise, research by Hussain (2020) conducted at Indiana University, Bloomington, found that both students and lecturers held a generally positive view of AI's role in instruction. When it comes to successfully integrating AI into science education—especially in subjects like biology—the attitudes of both educators and students matter greatly. It's not enough for teachers

to have the knowledge and skills; students must also be open and receptive to learning through AI-based methods. This highlights the importance of specifically examining the attitudes of biology education students toward the use of AI in teaching and learning biology.

### Research Questions

The following research questions were posed for the study:

1. What are the perceptions of undergraduate biology education students toward the integration of AI in teaching and learning of Biology?
2. What are the attitudes of undergraduate biology education students toward the integration of AI in teaching and learning of Biology?

### Methodology

This study employed a descriptive survey research design to gather and analyze data. The research population consisted of all second- and third-year students enrolled in the Biology Education program at the University of Nigeria, Nsukka, during the 2024/2025 academic session. Specifically, the population included 76 third-year students and 53 second-year students, totalling 129 respondents from the Department of Science Education. Given the relatively small and manageable size of the population, no sampling was conducted, the entire group participated in the study.

Data were collected using a researcher-developed questionnaire titled Perception and Attitude of Undergraduate Biology Education Students towards the Integration of Artificial Intelligence in the Teaching and Learning of Biology. The instrument was divided into two sections: Section A gathered demographic information about the respondents, while Section B comprised two clusters designed to assess students' perceptions and attitudes toward AI use in biology education. Items in this section were rated on a four-point Likert scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). For negatively worded items, the scoring was reversed.

Cluster 1 focused on students' perceptions of AI tools, while Cluster 2 explored their attitudes toward the use of AI in teaching and learning biology. To ensure the reliability of the instrument, Cronbach's alpha was used, yielding an internal consistency index of 0.87, indicating a high level of reliability. The data were analyzed using the Statistical Package for Social Sciences (SPSS), with mean and standard deviation

values computed to answer the study's two research questions. A benchmark mean of 2.50 was used as the

decision rule: items scoring 2.50 or higher were accepted, while those below 2.50 were rejected.

## Results

**Table 1: Mean and Standard Deviation of the Perceptions of Undergraduate Biology Education Students toward the Integration of AI in Teaching and Learning of Biology.**

S/N	Item Statement	Mean	SD	Decision
1.	I feel AI is effective for enhancing learning experiences in Biology	3.42	0.61	Agree
2.	I believe AI can play a role in biology education	3.37	0.53	Agree
3.	I think AI can personalize learning experiences for Biology students	3.22	0.54	Agree
4.	AI technologies can help students learn Biology at their own pace.	3.41	0.59	Agree
5.	I feel that AI can help reduce the workload of Biology instructors, by allowing them to focus on critical teaching aspects.	3.37	0.68	Agree
6.	I think that the use of AI in Biology education can lead to a higher quality of education.	3.34	0.75	Agree
7.	I understand that AI has the potential to assist Biology teachers in delivering personalized instruction tailored to individual student needs.	3.47	0.61	Agree
8.	I feel that the use of AI in assessments can provide a more accurate evaluation of Biology students' performance.	3.19	0.92	Agree
9.	I don't believe that AI has the potential to enhance collaborative learning among students	3.14	1.03	Agree
10.	I agree that Most AI apps are user friendly	3.31	0.62	Agree
11.	Most AI apps are easy to use in teaching and learning of biology	3.37	0.68	Agree
<b>Cluster Mean</b>		<b>3.33</b>	<b>0.69</b>	<b>Agree</b>

$N = 97; X < 2.50 = Disagree;$

$X \geq 2.50 = Agree$

Table 1 presents results from the analysis of data collected to determine the perceptions of undergraduate biology education students toward the integration of AI in teaching and learning of Biology. The findings show that the respondents agreed to all items (1 – 11) on the cluster, with mean responses ranging between 3.14 – 3.47. This implies that undergraduate Biology education students perceive AI as effective for enhancing learning experiences in Biology, user friendly, easy to use in teaching and learning of biology, can play a role in biology education, can personalize

learning experiences for Biology students, can help students learn Biology at their own pace, among others. The cluster mean of 3.66, which is greater than the benchmark mean of 2.50 for “agree” indicates that undergraduate Biology education students have a positive perception regarding the perceptions of undergraduate biology education students toward the integration of AI in teaching and learning of Biology. The cluster standard deviation of 0.63 indicates that the responses provided were not too different from each other.

## Research Question 2

**Table 2: Mean and Standard Deviation of the Attitudes of Undergraduate Biology Education Students toward the Integration of AI in Teaching and Learning of Biology.**

S/N	Item Statement	Mean	SD	Decision
12.	I use AI to facilitate my learning of Biology.	3.19	0.65	Agree
13.	Integrating AI in biology teaching can make learning more engaging.	3.34	0.56	Agree
14.	I actively engage in discussions regarding AI in education.	3.03	0.80	Agree
15.	AI can provide personalized learning experiences tailored to my needs.	3.05	0.94	Agree
16.	I would fully incorporate AI tools in working on biology projects.	3.30	0.72	Agree
17.	I recommend some AI tools to my course mates.	3.45	0.60	Agree
18.	I do not want AI to replace human teachers in biology classrooms.	3.28	0.75	Agree
19.	I would participate in AI-facilitated biology discussions online	3.22	0.65	Agree
20.	I would use AI-powered virtual labs to conduct biology experiments.	3.37	0.68	Agree
21.	I'm willing to try AI-powered simulations to learn biology concept.	3.36	0.63	Agree
<b>Cluster Mean</b>		<b>3.26</b>	<b>0.70</b>	<b>Agree</b>



$N = 97; X < 2.50 = \text{Disagree};$

$X \geq 2.50 = \text{Agree}$

Table 2 presents the results from the analysis of data collected to determine attitudes of undergraduate biology education students toward the integration of AI in teaching and learning of Biology. The findings show that the respondents agreed to all items (12 – 21) on the cluster, with mean responses ranging between 3.03 – 3.45. This implies that undergraduate Biology education students use AI to facilitate my learning of Biology, actively engage in discussions regarding AI in education, participate in AI-facilitated biology discussions online, are willing to try AI-powered simulations to learn biology concept, would participate in AI-facilitated biology discussions online, and would fully incorporate AI tools in working on biology projects, among others. The cluster mean of 3.26, which is greater than the benchmark mean of 2.50 for “agree”, indicates that undergraduate Biology education students have a positive attitude toward the integration of AI in teaching and learning of Biology. The cluster standard deviation of 0.70 indicates that the responses provided by individual respondents are similar to one another.

### Discussion of Findings

Findings on research question 1 on table 1 revealed that undergraduate biology education students hold a uniformly positive view of AI's potential to enhance their learning experiences. Also students perceive AI as an effective tool for personalizing learning, facilitating biology education, and promoting self-paced learning. This finding showed that undergraduate biology education students hold an overwhelmingly positive view of Artificial Intelligence (AI) in enhancing their learning, seeing it as effective for personalized, facilitated, and self-paced learning.

These findings align with previous research by Christilda (2023), who found that students pursuing business majors also hold positive perceptions of AI in education, viewing it as an effective tool for enhancing learning experiences. These findings also align with and diverge from those of Ugwuoti (2023), who found that biology students had limited experience with AI tools but recognized their potential to enhance their understanding of complex biology concepts. While both studies highlight the importance of training and support for effective AI integration, they collectively suggest that undergraduate biology education students are receptive to AI-enhanced learning experiences.

The findings on table 2 showed that respondents agreed with all items (12-21). This indicates that undergraduate biology education students utilize AI to support their biology learning, actively participate in discussions about AI in education, engage in online AI facilitated biology discussions, and are willing to explore AI-powered simulations for learning biology concepts. They also expressed willingness to participate in AI-facilitated online discussions and fully integrate AI tools into biology project work. This demonstrates undergraduate biology education students' positive disposition toward AI integration in biology education.

This finding showed that undergraduate biology education students have a positive disposition toward AI integration in biology education, actively utilizing AI to support their learning, engaging in AI-facilitated discussions, and showing willingness to explore AI-powered simulations and integrate AI tools into project work. This study aligns with the findings of Eteng-Uket and Effiom (2024), who found that 98% of higher education students exhibited a positive attitude towards AI-based educational interventions for learning and research, indicating a strong positive correlation between students' attitudes and AI adoption in education. This finding is also consistent Hussain's (2020) study, which revealed that university students and teachers at Indiana University, Bloomington, exhibited a positive attitude towards the instructional role of artificial intelligence.

### Conclusion

The results of the study showed that the students generally had a positive perception of Artificial Intelligence (AI), seeing it as a helpful addition to their biology education. They believed that AI could support their learning process, encourage meaningful conversations around its use in education, and enrich their overall academic experience. In particular, students appreciated AI's ability to tailor learning to individual needs, enhance biology instruction, and allow them to learn at their own pace. In addition to their perception, the students also demonstrated a favourable attitude toward the integration of AI in their learning. They acknowledged its potential to boost academic performance, make lessons more engaging, and offer access to modern, technology-driven learning tools.

### Contribution to knowledge

This study adds to the growing body of literature on the use of Artificial Intelligence in education by specifically focusing on its integration into biology teaching and learning. It explores how undergraduate biology education students perceive and respond to the use of AI in their academic environment, while also shedding light on both the advantages and challenges associated with adopting AI in this field. The insights gained from this research can help guide the development of AI-powered instructional tools and teaching strategies that align with the learning needs and preferences of biology education students. By examining how AI integration relates to students' academic performance, the study offers practical evidence on how AI technologies can be used to enhance learning outcomes and engagement in biology. In addition, the findings and suggestions presented here can serve as a stepping stone for future investigations into AI in science education. They provide valuable direction for educators, policymakers, and researchers seeking to maximize the benefits of AI to improve the quality and effectiveness of biology education.

### Recommendations

1. Educators should incorporate AI-based tools and resources into biology education to enhance student learning outcomes.
2. Policymakers should provide support and resources for teacher professional development in AI integration.
3. Technology developers should design AI-powered tools that are user-friendly, accessible, and aligned with learning objectives.
4. Teachers should prioritize developing students' critical thinking, problem-solving, and media literacy skills.
5. Further research is needed to explore the impact of AI on student learning outcomes, teacher practices, and the biology education curriculum.

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