FROM CURIOSITY TO CAUTION: EXPLORING UNIVERSITY PHYSICS EDUCATION AND INTEGRATED SCIENCE STUDENTS' ATTITUDES, USAGE AND BENEFITS OF GENERATIVE ARTIFICIAL INTELLIGENCE

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Abstract
Across different disciplines, the domination of generative Artificial Intelligence (AI) in education has been attracting attention among teachers and students. This study explored the attitudes of university Physics Education and Integrated Science students towards usage of generative AI, focusing on their perceived benefits, concerns, and willingness to integrate AI tools into future classroom practice. The study adopted a descriptive survey research design. Data were collected from 88 pre-service teachers through a structured questionnaire of 0.82 reliability coefficient administered online in selected teacher education universities, while descriptive and inferential statistics were used for the analysis. Using purposive sampling technique, findings revealed that many of the respondents viewed generative AI as a useful educational tool capable of supporting lesson preparation, improving access to information, and

enhancing creativity in teaching and learning. The study, however, further revealed concerns about overdependence on AI, imaginable drop in critical thinking, spread of misinformation, and violation of academic integrity. Despite these, larger samples of students indicated a substantial interest and curiosity in AI use for academic endeavours, if exposed to proper ethical guidelines and training. The study concluded that university physics education and integrated science students indicated good attitudes which reflected both optimism and caution towards generative AI benefits and usage in education.

Keywords: Attitude, Generative Artificial Intelligence, Physics, Intermediate Science

Introduction

The growing integration of digital technology into education has changed the way teaching and learning activities take place in Nigeria and other developing nations. In recent times, tools like ChatGPT, Gemini, and Copilot have shown to teachers, a new dimension in the practice of education. These tools possess the capacity to provide explanations to basic or abstract concepts, generate lesson notes for implementation, solve problems in step-by-step analyses, and support academic writings following the right prompts. For these reasons, interest in the academic use of generative tools has considerably increased among students, teachers, and researchers alike. Zhang, Schießl, Plößl, Hofmann and Gläser-Zikuda (2023); Lee and Zhai (2024) submitted that many science education scholars now take generative AI as a valuable academic companion due to its effectiveness in gaining access to information and assisting lesson preparation. In Nigeria for instance, the use of AI in education is gradually becoming more visible, especially among tertiary institution students.

Many education students now rely on these tools for assignments, conceptual clarifications, and several other academic supports. The striking reliance, though, cannot be separated from the challenges

faced by students in the Nigerian educational system. According to Amuda and Olajide, (2024), some of these challenges include but not limited to overcrowded classrooms, inadequate instructional materials, and poor access to laboratory facilities. Consequent upon these, these tools became readily attractive in providing rapid responses and innumerable opportunities for students to learning in the face of uncertainty. Omosule and Oguejiofor (2026) noted that among Nigerian pre-service teachers there is an increasing level of exploitation and exploration of AI tools in information search in bid to harvesting quick response for use. Similarly, Adigun, Tijani, Haihambo and Enock (2025) submitted that many Nigerian teachers-in-training indicated positive intention to use of these technologies in classroom practice, owing to the highly responsive benefits therein. However, beyond these, concerns that surround generative AI use have been informing debates among the academics. Some scholars (Babajide, Adeymo and Omosule, 2026) contend that too much reliance on AI may well weaken critical thinking, creativity, and problem-solving abilities among science education learners. Others have raised worries over inaccurate information, plagiarism, and unverified use of AI-generated content (Nyaaba et al., 2024). Within science education, another fear holds that students may depend too heavily on AI-generated responses and this may affect their resort to deep scientific reasoning and inquiry processes. Ramnarain et al. (2025) also observed that although pre-service science teachers acknowledge the usefulness of generative AI, many still express cautious concerns about its reliability and long-term implications for teaching and learning.

The situation comes to a more worrisome level when observed from the perspective of future Physics and Integrated Science teachers whose professional responsibilities involve critical thinking, experimentation, and understanding of abstract concepts. Since teachers' attitudes often influence their classroom behaviour and decisions on instructional of use, understanding how university physics and integrated science students perceive generative AI has become necessary. While some may approach it with enthusiasm and

curiosity, others may remain cautious because on issues bothering around ethical and pedagogical concerns. It is against this background that this study seeks to explore the attitudes, usage and benefits of university Physics and Integrated Science students towards generative AI in education. This is because, integrated science is the foundation upon which physics and other core science subjects are built. The synergy becomes evident in the fact that same opportunities and risks may be available to them in terms of delivery of contents, assessment of information, and scientific inquiry in basic education through use of generative artificial intelligence.

There is no gainsaying the fact that institutions of learning across the world, are gradually adjusting to the reality that AI-powered tools for their capacities to shape how students learn, source for information, and complete academic tasks. Particularly in teacher education, intellectuals have developed keen interest in understanding how science education students perceive and engage the technologies, knowing that their attitudes to the emerging know-hows will shape future classroom practices. Recently, literature suggests that generative AI has the capacity to support lesson preparation, simplify difficult concepts, promote personalised learning, while improving instructional creativity when properly utilised (Babajide et al., 2026). Several other studies have equally reported positive attitudes among pre-service teachers towards generative AI. In a study on students' acceptance of AI tools in information sourcing, Zhang et al. (2023) established that many future teachers regarded AI as a supportive tool capable of improving their efficiency and access to learning resources. Similarly, Lee and Zhai (2024), in their study on science lesson planning, submitted that teachers in training perceived ChatGPT as useful for generating classroom activities and supporting inquiry-based science instruction. These findings propose that many future educators are beginning to see AI not merely as a technological trend, but as teaching assistant that reduces workload and enhances classroom instructional delivery.

In science education, the discussion appears more significant because science teaching requires explanation, experimentation, critical thinking for conceptual clarity. Ramnarain et al. (2025) reported that university science education students established strong intention to adopt generative AI in inquiry-based teaching for its ability to give instant explanations and instructional ideas. The study further noted that AI tools inspire curiosity and engagement among students if properly integrated into classroom activities. Likewise, recent research by Ndlovu et al. (2026) revealed that AI-supported lesson planning improved adaptive instructional reasoning among pre-service science teachers, specifically in resource-constrained learning locations. In southwest, the mounting acceptance of AI tools among students and educators has also attracted intellectual attention. Adigun et al. (2025) studied the intention of Nigerian pre-service teachers' to adopt AI in inclusive classrooms and noted that many students exhibited favourable attitudes towards AI integration, particularly when they believed the technology could improve their effectiveness in teaching. Similarly, Awofala et al. (2025) found that Nigerian science, technology, and mathematics teachers demonstrated strong willingness to adopt intelligent educational tools, though factors such as technological self-efficacy and accessibility may influence their rate of acceptance. In another study in south-western Nigeria, science educators in Lagos State acknowledged that generative AI could improve chemistry teaching through improved instructional backing and access to scientific clarifications. These studies indicate that the Nigerian educational environment is gradually adjusting to global movement digital intelligence, despite the infrastructural and technological challenges. However, literature also reveals cumulative worries regarding the scholastic implications of generative AI. One of the major concerns expressed by scholars is that too much dependence on AI may weaken critical thinking and problem-solving abilities among students. Sharples (2023) for instance, contended that while generative AI supports learning, ethical safeguards are needed to prevent misuse and overreliance. Similarly, Akpan et al. (2024) observed that misinformation, plagiarism concerns and academic

dishonesty are central issues that surround adoption of AI in education.

Beyond ethical and other issues cited above, researchers have noted that teacher education programmes still struggle to provide satisfactory preparation for responsible incorporation of AI into the profession. Spasopoulos et al. (2025), in a systematic review of generative AI in science teacher education, submitted that although AI adoption may be rapidly increasing, many university education students still do not enough digital literacy and pedagogical wherewithal for effective classroom application. He further noted that this situation is predominantly rife in developing countries where imbalanced access to digital infrastructure may further widen educational gaps. From the above literature review, it is apparent that university education students' attitudes towards generative AI, usage and benefits are shaped both by optimism and caution. While many future educators recognise the usefulness of generative AI in lesson preparation, instructional support, and academic learning, ethical concerns, overdependence, and misinformation have continued to influence their perception. Most importantly, existing studies (Wang and Tsai, 2019, Vanderburg, Mann and Cowling, 2021) have concentrated more broadly on teacher education and science education, with limited attention specifically given to university Physics education and Integrated Science students in the Nigerian context. This gap therefore justifies the need for the present study which seeks to explore the attitudes of university Physics education and Integrated Science students towards usage and benefits of generative AI. This synergy is curriculum-wise, as integrated science lays the foundation upon which physics is built, which makes both to form a continuum. In the same vein, both pedagogically depends on inquiry, experiments, and problem-solving, and these exposed them to similar and opportunities in using generative AI as they are both trained together under the same educational umbrella.

Objectives of the Study

i. Examine the attitudes of university physics education and integrated science students towards generative AI
ii. Investigate the extent to which university physics education and integrated science students use generative AI for academic purposes
iii. Identify the perceived benefits of generative AI among university physics education and integrated science students
iv. Examine the concerns of university physics education and integrated science students regarding the use of generative AI in teaching and learning; and
v. Determine the willingness of university physics education and integrated science students to integrate generative AI into future classroom practice.

Research Questions

i. What are the attitudes of university physics education and integrated science students towards generative AI?
ii. To what extent do university physics education and integrated science students use generative AI for academic purposes?
iii. What perceived benefits do university physics education and integrated science students associate with generative AI?
iv. What concerns do university physics education and integrated science students have regarding the use of generative AI in teaching and learning?
v. To what extent are university physics education and integrated science students willing to integrate generative AI into future classroom practice?

Hypotheses

i. There is no significant difference between the attitudes of university physics education and integrated science students on generative AI
ii. There is no significant difference between the willingness of university physics education and integrated science students to integrate generative AI into future classroom practice

Methodology

The study adopted a descriptive survey research design to explore the attitudes of university physics education and integrated science students towards generative Artificial Intelligence. The population comprised all university physics education and integrated science students in South-western Nigeria. A sample of respondents was selected using a simple random sampling technique. Data were collected using a researcher-designed questionnaire titled University Science Education Students' Attitudes Towards Generative AI Questionnaire (SAT-GAIQ). The instrument contained items on attitudes towards generative AI, extent of usage, perceived benefits, concerns, and willingness to integrate AI into future classroom practice. The questionnaire items were structured on a four-point Likert scale. It was validated by experts in science education and educational technology, while its pilot reliability test yielded a Cronbach's Alpha of 0.82. The questionnaire was administered online to 88 participants, and the data collected were analysed using descriptive statistics such as frequency counts, percentages, mean, and standard deviation to answer the research questions.

Results

Research Question One: What are the attitudes of university physics education and integrated science students towards generative AI?

Table 1.0: Descriptive Statistics on the Attitudes of university physics education and integrated science students Towards Generative AI

S/N	Item Statement	Physics Mean (SD) N = 32	Status	Int/Science Mean (SD) N = 56	Status
1	I find generative AI useful for academic activities	3.31 (0.69)	High	3.24 (0.74)	High
2	I believe generative AI will become important in future classrooms	3.07 (0.81)	High	3.15 (0.83)	High
3	I enjoy exploring AI tools for lesson preparation and assignments	3.14 (0.79)	High	3.03 (0.84)	High
4	I believe generative AI will become important in future classrooms	3.39 (0.64)	High	3.30 (0.69)	High
5	I feel uncertain about relying heavily on generative AI	2.91 (0.88)	High	2.83 (0.92)	High
	Grand Mean	**3.16 (0.76)**	**High**	**3.11 (0.80)**	**High**

The results in *Table 1.0* revealed that both university physics education and integrated science students demonstrated high positive attitudes towards generative AI as both grand mean are seen to be greater than the benchmark mean (2.50). The Physics students however, obtained a slightly higher grand mean score of 3.16 (0.76) compared to 3.11 (0.80) recorded by the Integrated Science students. This implies that respondents from both groups generally perceived generative AI as useful and relevant for academic and future teaching purposes, although some concerns about overdependence on AI were also expressed.

Research Question Two: To what extent do university physics education and integrated science students use generative AI for academic purposes?

Table 2.0: Descriptive Statistics on the Extent of Use of Generative AI for Academic Purposes among University Physics Education and Integrated Science Students

S/N	Item Statement	Physics Mean (SD) N = 32	Status	Int/Science Mean (SD) N = 56	Status
1	I frequently use generative AI to search for academic information and explanations	3.28 (0.71)	High Extent	3.19 (0.76)	High Extent

S/N	Item Statement	Physics Mean (SD) N = 32	Status	Int/Science Mean (SD) N = 56	Status
2	I use generative AI for assignments and academic tasks	3.11 (0.83)	High Extent	3.05 (0.81)	High Extent
3	I use generative AI tools while preparing lesson notes or presentations	3.06 (0.79)	High Extent	2.98 (0.86)	High Extent
4.	I rely on generative AI to simplify difficult academic concepts	3.34 (0.66)	High Extent	3.21 (0.73)	High Extent
5.	I frequently use generative AI platforms for personal study and learning	3.17 (0.74)	High Extent	3.09 (0.80)	High Extent
	Grand Mean	3.19 (0.75)	High Extent	3.10 (0.79)	High Extent

The results presented in *Table 2.0* revealed that both university physics education and integrated science students used generative AI to a high extent for academic purposes as both grand mean are seen to be greater than the benchmark mean (2.50). The Physics education students recorded a slightly higher grand mean score of 3.19 (0.75) compared to 3.10 (0.79) obtained by the Integrated Science students. This suggests that respondents from both groups, to a high extent, frequently utilised generative AI tools for academic support, lesson preparation, assignments, and understanding difficult concepts.

Research Question Three: What perceived benefits do university physics education and integrated science students associate with generative AI?

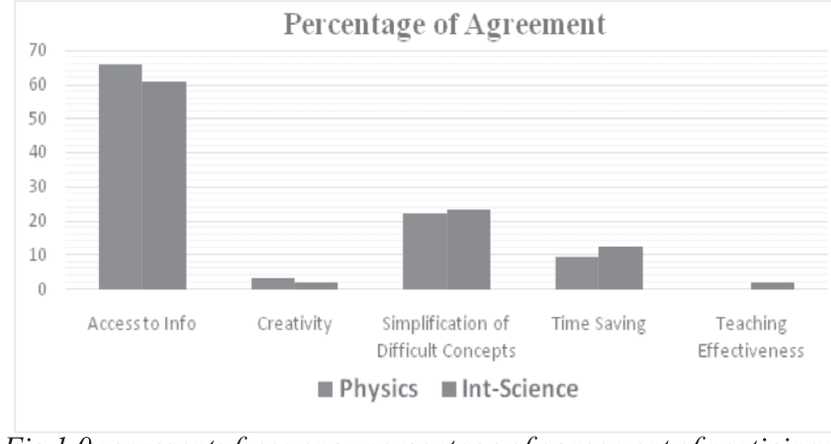
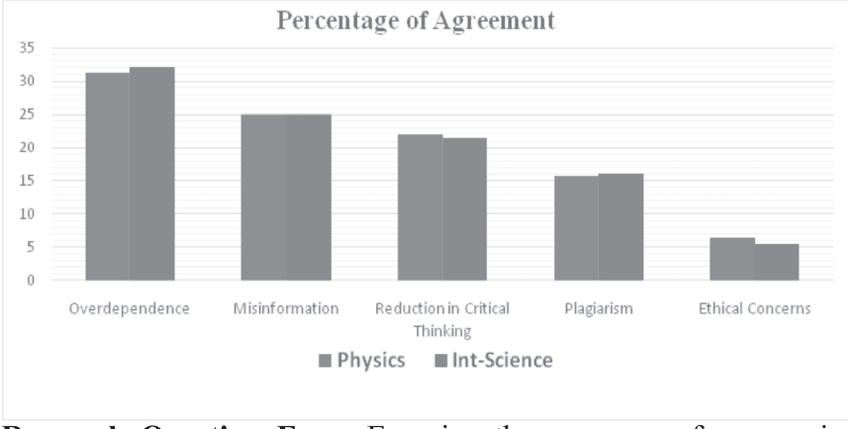


Fig 1.0 represents frequency percentage of agreement of participants against the given items.

The results presented in *Figure 1.0* revealed that both university physics education and integrated science students identified several benefits of generative AI. However, access to academic information was the most prominent perceived benefit, with 21 Physics students (65.6%) slightly higher than their 34 Intermediate Science counterparts (60.7%). Simplifying difficult concepts also recorded a notable proportion among both groups. While time-saving was moderately acknowledged, creativity during lesson preparation and improvement of teaching effectiveness recorded very low frequencies, with Integrated Science students slightly indicating more recognition of teaching effectiveness than Physics students. Succinctly put, the findings suggest that respondents primarily associate generative AI with information access and conceptual support rather than pedagogical transformation.

Research Question Four: Examine the concerns of pre-service physics and intermediate science teachers regarding the use of generative AI in teaching and learning

Figure 1.1: Frequency Distribution of Concerns of University Physics Education and Integrated Science Students Regarding Generative AI



Research Question Four: Examine the concerns of pre-service physics and intermediate science teachers regarding the use of generative AI in teaching and learning

Figure 1.1: Frequency Distribution of Concerns of University Physics Education and Integrated Science Students Regarding Generative AI

S/N	Item Statement	Physics Mean (SD) N = 32	Status	Int/Science Mean (SD) N = 56	Status
1	I am willing to use generative AI to prepare lesson notes in my future teaching	3.28 (0.71)	High Extent	3.19 (0.76)	High Extent
2	I will integrate generative AI tools into my classroom instruction when I become a teacher	3.15 (0.80)	High Extent	3.08 (0.82)	High Extent
3	I am ready to encourage my students to use generative AI for learning purposes	3.22 (0.74)	High Extent	3.12 (0.79)	High Extent
4	I believe generative AI will be part of my future teaching practice	3.34 (0.67)	High Extent	3.25 (0.71)	High Extent
5	I will need training before effectively using generative AI in the classroom	3.41 (0.65)	High Extent	3.36 (0.68)	High Extent
	Grand Mean	3.28 (0.71)	High Extent	3.20 (0.75)	High Extent

Table 3.0: Mean and Standard Deviation on Willingness to Integrate Generative AI into Future Classroom Practice among University Physics Education and Integrated Science Students

The results presented in *Table 3.0* revealed that both university physics education and integrated science students demonstrated to a high extent, a strong willingness to integrate generative AI into their future classroom practice. The Physics group recorded a slightly higher grand mean of 3.28 (0.71) compared to 3.20 (0.75) for the Integrated Science group. The highest rated item for both groups was the need for training before effective classroom integration of generative AI, indicating that while respondents are willing to adopt AI tools, they also recognize the importance of proper preparation and professional development

Research Hypothesis One: There is no significant difference between the attitudes of university physics education and integrated science students

Table 4.0: Independent Samples t-test on the Difference in Attitudes of University Physics Education and Integrated Science Students Towards Generative AI

Group	N	Mean	SD	df	t-value	p-value	Decision
Physics	32	3.16	0.76	86	1.12	0.265	Not Sig
Integrated-Science	56	3.11	0.80				

The result of the independent samples t-test in *Table 4.0* shows that there is no significant difference in the attitudes of university physics education and integrated science students towards generative AI ($t(86) = 1.12$, $p = 0.265 > 0.05$). This implies that both groups share similar positive dispositions towards generative AI, and their attitudes are not significantly influenced by their subject specialisation

Research Hypothesis Two: There is no significant difference between the willingness of university physics education and integrated science students to integrate generative AI into future classroom practice

Table 5.0: Independent Samples t-test on the Difference in Willingness to Integrate Generative AI into Future Classroom Practice

Group	N	Mean	SD	df	t-value	p-value	Decision
Physics	32	3.28	0.71	86	0.92	0.359	Not Sig
Integrated-Science	56	3.20	0.75				

The result of the independent samples t-test presented in *Table 5.0* indicates that there is no significant difference in the willingness of university physics education and integrated science students to integrate generative AI into future classroom practice ($t(86) = 0.92$, $p = 0.359 > 0.05$). This implies that both groups exhibit similar levels of readiness to adopt generative AI in their future teaching practice,

suggesting that subject area does not significantly influence their willingness to integrate AI into classroom instruction.

Discussion of Findings

The findings of this study revealed that university physics education and integrated science students commonly hold high positive attitudes towards generative AI, though with a balanced sense of caution. Both groups agreed that the tools are useful for their academic work, improves their access to information, and can effectively support their classroom teaching and learning, if proper training is given on information verification and ethical concerns. This agrees with earlier studies which reported that university physics education students are increasingly accepting AI tools as part of their learning support system, especially for lesson preparation and clarifications of abstract concepts. The study also showed that most of the participants already engaged generative AI to a high extent for academic purposes, particularly for accessing information and simplifying complex ideas. This reflects the growing dependence on digital tools among today's pre-service teachers, especially in contexts where learning resources may not always be readily available. Concerns bothering on overdependence, reduction in critical thinking, and issues of academic dishonesty, however remain persistent. This suggests that while students are open to AI, they are also aware of its possible negative effects on learning quality and integrity. Remarkably, the inferential statistics showed no significant difference between Physics and Integrated Science teachers in both their attitudes and willingness to integrate generative AI to their future classroom practice. This implies that subject area does not influence how pre-service teachers perceive or intend to use AI, and that it further confirms the synergy between integrated science and physics teaching. Overall, the findings suggest a "curious but cautious" acceptance of generative AI among future science teachers in south-western Nigeria.

Recommendations

i. Teacher education institutions should move beyond basic

awareness of generative AI and deliberately integrate structured AI literacy modules into Physics Education and Integrated Science methods. These should focus not only on how to use AI tools, but also on how to evaluate information given for accuracy and classroom suitability.

ii. Given the concern about academic dishonesty, institutions should develop clear AI usage guidelines for teacher trainees, explicitly stating acceptable and unacceptable uses of generative AI in academic work, especially in lesson preparation and assignment submission.

iii. The willingness of respondents to adopt AI in future classrooms suggests a readiness gap, teacher education programmes should therefore introduce practical classroom simulation sessions where pre-service teachers practise integrating generative AI into lesson delivery under supervision.

iv. In view of the absence of significant difference between Physics and Integrated Science teachers, AI training programmes should be designed as cross-disciplinary workshops, rather than subject-segregated training, to promote shared digital pedagogical competence.

v. Finally, institutions should encourage continuous professional development by organizing seminars and hands-on training on responsible AI use in science education, and ensure that pre-service teachers are not only users of AI but also critical and ethical implementers of same in real classroom situations.

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