

ChatGPT Awareness and Utilization Among Undergraduate Biology Education Students at the University of Nigeria, Nsukka: Implications for Mathematics Education

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ARTICLE INFO	ABSTRACT
Published Online: 12 October 2026	The rapid diffusion of generative artificial intelligence (GenAI) into higher education has created new opportunities for learning while also raising concerns about accuracy, academic integrity, digital inequality, and overreliance on automated outputs. This study examined awareness, utilization, challenges, and perceived institutional responses to ChatGPT among undergraduate Biology Education students at the University of Nigeria, Nsukka. A descriptive survey design was adopted. Eighty questionnaires were distributed to students across 100–400 levels, and 67 usable responses were returned, representing an 83.75% response rate. Data were collected using a researcher-developed Questionnaire on the Extent of Awareness and Usage of ChatGPT (QEAUC), which demonstrated an overall Cronbach's alpha of .798. Frequency and percentage were used to analyse awareness items, while mean and standard deviation were used for utilization, challenges, and proposed solutions. The findings showed substantial awareness of ChatGPT: respondents demonstrated awareness on seven of eight awareness items, although only 25.4% recognized that ChatGPT uses natural language processing to understand and respond to queries. Overall utilization was high ($M = 2.81$, $SD = 0.81$ on a 4-point scale), with particularly high use for content creation, academic research, education, assignments, brainstorming, and conversation practice. Respondents also agreed that important barriers included inadequate internet access ($M = 3.64$), training costs ($M = 3.46$), and rote or superficial use ($M = 3.51$). The strongest proposed solutions were free internet access ($M = 3.85$), free Wi-Fi ($M = 3.82$), curriculum integration ($M = 3.76$), and guided learning activities ($M = 3.58$). The study concludes that ChatGPT is already embedded in the academic practices of many participating Biology Education students, but effective integration requires AI literacy, reliable digital infrastructure, explicit institutional guidance, and assessment practices that preserve student thinking and academic integrity.
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BACKGROUND AND PROBLEM

Generative artificial intelligence has rapidly become part of higher education, particularly through conversational systems such as ChatGPT. Unlike conventional search engines, ChatGPT can generate, reorganize, explain, summarize, and revise text in response to natural-language prompts. Recent research shows that university students use generative AI for activities such as brainstorming, summarizing, writing support, research-related tasks, and language development, while simultaneously expressing concerns about reliability, plagiarism, critical thinking, and institutional regulation (Baek et al., 2024; Chan & Hu, 2023; Ravšelj et al., 2025).

The educational relevance of ChatGPT is particularly important in teacher education. Biology Education students are not only learners; they are future teachers who will shape how younger learners encounter digital technologies and scientific knowledge. In biology, where students work with complex concepts, terminology, explanations, laboratory reports, and research tasks, conversational AI can potentially provide supplementary explanations, examples, brainstorming support, and language assistance. However, the educational value of these affordances depends on how students use the technology and how institutions frame its use. A recent systematic review found that ChatGPT applications in higher education include writing, personalized learning, communication, collaboration, research, curriculum development, and assessment, but also noted continuing limitations and the need for stronger empirical evidence (Baig & Yadegaridehkordi, 2024).

The Nigerian context adds an important dimension. Access to digital learning tools depends not only on students' awareness and willingness to use them but also on internet connectivity, electricity, device affordability, and opportunities for digital-literacy development. Evidence from Nigerian universities indicates high awareness and academic use of ChatGPT among undergraduates, alongside concerns about plagiarism, reliability, and possible weakening of critical thinking (Nnaemeka & Ogunbadejo, 2024; Oladokun et al., 2024). These contextual issues make it necessary to understand how students in specific disciplinary programmes are encountering ChatGPT.

Despite the expanding literature on generative AI in higher education, discipline-specific evidence from Nigerian teacher education remains comparatively limited. In particular, there is a need to document what Biology Education students know about ChatGPT, how they use it, what obstacles they encounter, and what institutional supports they consider necessary. The present study addresses this need by examining undergraduate Biology Education students at the University of Nigeria, Nsukka (UNN).

Purpose of the Study

The study investigated the awareness and utilization of ChatGPT among undergraduate Biology Education students at the University of Nigeria, Nsukka. Specifically, it sought to determine: (a) students' awareness of ChatGPT; (b) the extent to which they utilize ChatGPT; (c) the challenges they encounter in using ChatGPT; and (d) perceived measures for addressing those challenges.

Research Questions

1. What is the level of awareness of ChatGPT among undergraduate Biology Education students at the University of Nigeria, Nsukka?
2. What is the extent of ChatGPT utilization among undergraduate Biology Education students at the University of Nigeria, Nsukka?
3. What challenges do undergraduate Biology Education students encounter in using ChatGPT?
4. What measures do undergraduate Biology Education students perceive as appropriate for addressing the challenges of ChatGPT utilization?

Theoretical Perspective

The study is informed primarily by the Technology Acceptance Model (TAM), which explains technology use in relation to perceived usefulness and perceived ease of use. Although the original TAM was developed before generative AI, recent applications continue to demonstrate the usefulness of acceptance-based perspectives for understanding why users adopt AI-enabled technologies (Mohr & Köhl, 2021). In the present study, TAM provides a useful interpretive lens for understanding why students may move from awareness to actual utilization when they perceive ChatGPT as useful and accessible. Importantly, however, the study did not statistically test the TAM constructs; therefore, TAM is treated as a theoretical lens rather than as a tested causal model.

REVIEW OF RELATED LITERATURE

ChatGPT and Higher Education

Research since the emergence of ChatGPT has shown that students generally recognize both its usefulness and its limitations. Chan and Hu (2023) found that students viewed generative AI as potentially useful for personalized learning, writing, idea generation, and other academic activities, while raising concerns about accuracy, ethics, and overdependence. In a large international study, Ravšelj et al. (2025) reported that students commonly used ChatGPT for brainstorming, summarizing texts, and locating research-related information. Students also recognized its limitations and supported the need for institutional regulation.

Evidence from the United States similarly suggests that ChatGPT use is shaped by student characteristics and institutional policy. Baek et al. (2024), using a sample of

1,001 college students, found variation in use according to factors such as major, age, gender, and institutional policy. This suggests that ChatGPT use is not simply a matter of individual preference; the institutional environment can facilitate or constrain adoption.

Systematic reviews reinforce the rapid expansion of ChatGPT research. Baig and Yadegaridehkordi (2024) identified diverse applications across higher education, while Bhullar et al. (2024) highlighted the growing body of evidence and the need for a more coherent research agenda. Experimental evidence is also becoming more encouraging but should be interpreted cautiously: Deng et al. (2025) found positive effects of ChatGPT interventions on academic performance, affective-motivational outcomes, and higher-order thinking propensities, while noting methodological limitations and the need for better-designed studies.

AI Literacy, Responsible Use, and Institutional Support

Awareness of ChatGPT should not be equated with AI literacy. A student may know that ChatGPT exists and use it frequently without understanding how generative systems produce outputs, why outputs may be inaccurate, or how to verify claims. UNESCO (2023) therefore advocates a human-centred approach to generative AI in education, emphasizing ethical validation, data protection, equity, institutional preparedness, and human oversight. This distinction is directly relevant to the present study because respondents demonstrated broad awareness of ChatGPT but much weaker awareness of the natural-language-processing mechanism behind it.

Responsible use also requires explicit educational guidance. A systematic review of implementation challenges identified technological infrastructure, equity, data quality and security, ethics, and human-AI collaboration as major areas requiring attention (Challenges of Implementing ChatGPT on Education, 2025). Thus, universities need more than access to AI tools: they need institutional policies, staff development, student AI-literacy programmes, and assessment designs that encourage students to demonstrate their own reasoning.

Nigerian Context

Recent Nigerian studies provide evidence that ChatGPT is already visible in undergraduate academic life. Nnaemeka and Ogunbadejo (2024) reported high awareness and knowledge of ChatGPT among undergraduates at Nnamdi Azikiwe University, alongside widespread academic use and concerns about plagiarism and critical thinking. Oladokun et al. (2024) similarly found that Nigerian undergraduates recognized the time-saving and information-access benefits of ChatGPT but raised concerns about reliability and limitations in the currency and quality of

information. These findings provide a useful national context for interpreting the UNN results.

METHOD

Research Design and Setting

A descriptive survey design was used. The study was conducted among undergraduate Biology Education students in the Department of Science Education, University of Nigeria, Nsukka, Enugu State, Nigeria. The target population comprised 307 students across 100-400 levels: 131 in 100 level, 79 in 200 level, 53 in 300 level, and 44 in 400 level.

Sample and Sampling

The study involved 80 undergraduate Biology Education students selected from the 100-400 levels using simple random sampling through balloting without replacement, with 20 students selected from each level. Of the 80 questionnaires administered, 67 were properly completed and returned, representing an 83.75% response rate. Consequently, data analysis was based on the 67 valid responses.

Instrument

Data were collected using the researcher-developed Questionnaire on the Extent of Awareness and Usage of ChatGPT (QEAUC). The instrument contained four clusters: awareness, utilization, challenges, and proposed solutions. Awareness items were answered as Agree/Not Agree. Utilization items used a four-point scale ranging from Very High Extent to Very Low Extent. Challenges and proposed solutions were rated on a four-point agreement scale from Strongly Agree to Strongly Disagree.

Validity and Reliability

Two experts in the Department of Science Education, University of Nigeria, Nsukka, one in Biology Education and one in Measurement and Evaluation, face-validated the instrument. For reliability, the instrument was administered to 30 Integrated Science Education students who were not part of the study sample. Cronbach's alpha coefficients were .81 for awareness, .78 for utilization, .82 for challenges, and .79 for proposed solutions, producing an overall coefficient of .798. These values indicate acceptable internal consistency for the descriptive survey.

Data Analysis

Frequencies and percentages were used for the awareness items. Means and standard deviations were used for utilization, challenges, and proposed solutions. For the four-point scales, a mean of 2.50 or above was interpreted as a high extent or agreement, whereas a mean below 2.50 indicated low extent or disagreement. The analyses were conducted using SPSS Version 25.

RESULTS

Research Question 1: Awareness of ChatGPT

Item	Aware n (%)	Not aware n (%)
ChatGPT is an AI chatbot	61 (91.0)	6 (9.0)
One can learn about ChatGPT through social media	61 (91.0)	6 (9.0)
ChatGPT is an AI-driven tool	65 (97.0)	2 (3.0)
ChatGPT is one of many recently invented technological chatbots	64 (95.5)	3 (4.5)
ChatGPT can be accessed through smartphones, tablets, and computers	66 (98.5)	1 (1.5)
ChatGPT is a computer program that can converse with humans	58 (86.6)	9 (13.4)
ChatGPT can answer questions on a wide range of topics	63 (94.0)	4 (6.0)
ChatGPT uses NLP to understand and respond to user queries	17 (25.4)	50 (74.6)

Note. n = 67. Percentages are based on valid responses. NLP = natural language processing.

The awareness results indicate broad familiarity with ChatGPT among the respondents. Seven of the eight awareness statements received an affirmative response from more than 86% of respondents. Awareness was highest for access to ChatGPT through smartphones, tablets, and computers (98.5%), followed by recognition of ChatGPT as an AI-driven tool (97.0%). In contrast, only 25.4% agreed that ChatGPT uses natural language processing to understand and respond to user queries, indicating a distinction between awareness of the tool and understanding of its underlying technology.

Research Question 2: Extent of ChatGPT Utilization

Use of ChatGPT	M	SD	Remark
Fond of using ChatGPT	2.03	0.46	Low extent
Entertainment	1.09	0.29	Low extent
Education	3.21	0.95	High extent
Learning	2.81	1.02	High extent
Content creation	3.57	0.70	High extent
Academic research	3.22	0.59	High extent
Assignment completion	3.12	1.15	High extent
Brainstorming	3.19	0.80	High extent
Conversation practice	3.34	0.79	High extent
Proofreading/editing	2.51	1.30	High extent
Cluster	2.81	0.81	High extent

Note. n = 67. Scale range = 1-4. Mean $\geq$ 2.50 = high extent.

The overall cluster mean of 2.81 (SD = 0.81) indicates high utilization. Academic and productivity-oriented uses were more prominent than entertainment. The highest-rated use was content creation (M = 3.57, SD = 0.70), followed by conversation practice (M = 3.34, SD = 0.79), academic research (M = 3.22, SD = 0.59), education (M = 3.21, SD = 0.95), and brainstorming (M = 3.19, SD = 0.80).

Research Question 3: Challenges of ChatGPT Utilization

Challenge	M	SD
Difficulty in understanding results	3.34	0.78
Limited information	2.51	1.29
Technical issues	2.91	1.17
Accuracy concerns	2.88	0.99

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Power failure	3.05	0.86
Lack of data	2.89	1.15
Funds to buy gadgets	3.27	0.82
Lack of internet	3.64	0.48
Cost of workshops/training	3.46	0.65
Rote learning of ChatGPT	3.51	0.56
Cluster	3.15	0.87

Note. $n = 67$. Scale range = 1–4. Mean ≥ 2.50 = agreement.

Respondents agreed with all listed challenges, producing a cluster mean of 3.15 (SD = 0.87). Lack of internet access was the strongest challenge (M = 3.64, SD = 0.48), followed by rote learning of ChatGPT (M = 3.51, SD = 0.56), training costs (M = 3.46, SD = 0.65), difficulty understanding results (M = 3.34, SD = 0.78), and the cost of acquiring gadgets (M = 3.27, SD = 0.82). Accuracy concerns also received agreement (M = 2.88, SD = 0.99).

Research Question 4: Perceived Solutions

Proposed solution	M	SD
Monitoring/evaluation of assignments and projects	3.58	0.61
Integration of ChatGPT into the curriculum	3.76	0.61
Promotion of digital literacy	3.45	0.50
Guided learning activities	3.58	0.61
Provision of constant power	3.22	1.07
Free Wi-Fi for students	3.82	0.39
Subsidized support for gadgets	3.42	0.55
Free internet for students	3.85	0.36
Free workshops/training sessions	3.27	0.83
Class discussions and debates	3.37	0.78
Cluster	3.53	0.63

Note. $n = 67$. Scale range = 1–4. Mean ≥ 2.50 = agreement.

Respondents strongly endorsed the proposed institutional responses, with a cluster mean of 3.53 (SD = 0.63). The highest-rated measures were free internet access (M = 3.85, SD = 0.36), free Wi-Fi (M = 3.82, SD = 0.39), curriculum integration (M = 3.76, SD = 0.61), monitoring and evaluation of assignments/projects (M = 3.58, SD = 0.61), and guided learning activities (M = 3.58, SD = 0.61).

DISCUSSION

The first major finding is that the participating Biology Education students demonstrated substantial awareness of ChatGPT. This is consistent with recent evidence from Nigeria and international higher education. Nnaemeka and Ogunbadejo (2024) reported high awareness and knowledge among undergraduates at Nnamdi Azikiwe University, while Chan and Hu (2023) found that university students were generally familiar with generative AI and recognized its potential educational benefits. The present study extends this evidence to Biology Education students at UNN.

However, the results reveal an important distinction between awareness of a tool and deeper AI literacy. Although more than 86% of respondents recognized most basic characteristics of ChatGPT, only 25.4% recognized its use of natural language processing. This suggests that many students know what ChatGPT does without necessarily understanding how generative AI systems operate. UNESCO

(2023) emphasizes the need for human-centred AI literacy and institutional capacity rather than simple access to generative AI. The finding therefore supports the need for structured AI-literacy programmes in teacher education.

The second finding is that ChatGPT utilization was high overall, particularly for content creation, academic research, education, assignments, brainstorming, and conversation practice. This pattern broadly aligns with international evidence showing that students use ChatGPT for brainstorming, summarization, writing, research, and communication (Baig & Yadegaridehkordi, 2024; Ravšelj et al., 2025). The low ratings for entertainment indicate that respondents primarily approached ChatGPT as an academic or productivity tool rather than as a recreational chatbot.

The finding of high academic utilization should not automatically be interpreted as evidence of improved academic performance. The present study measured self-reported use, not learning outcomes. Experimental evidence

suggests that ChatGPT can improve some learning outcomes under structured conditions, but the effects depend on instructional design and assessment quality (Deng et al., 2025). Consequently, the appropriate educational goal is not simply to increase use but to promote purposeful, critical, and ethically guided use.

The third finding concerns the challenges of utilization. Lack of internet access was the most prominent challenge, followed by rote use, training costs, and difficulty understanding outputs. These findings are especially important in the Nigerian context because access to generative AI is mediated by connectivity, electricity, devices, and affordability. They also reflect the wider literature, which identifies technological infrastructure, equity, accuracy, data concerns, and human oversight as central issues in educational implementation (Challenges of Implementing ChatGPT on Education, 2025; Oladokun et al., 2024).

The prominence of accuracy concerns is also educationally significant. ChatGPT can generate fluent responses that may contain errors or unsupported claims. Students who lack strong disciplinary knowledge may have difficulty detecting such errors. Thus, Biology Education programmes should teach students to verify AI-generated claims against textbooks, peer-reviewed literature, authoritative databases, laboratory evidence, and other credible sources. This is particularly important because future Biology Education teachers will need to model responsible information practices for their own students.

The fourth finding is the strong endorsement of institutional support measures. Free internet and Wi-Fi received the highest ratings, followed by curriculum integration, guided learning activities, and monitoring of assignments and projects. These responses suggest that students do not necessarily require unrestricted access; rather, they want an environment in which access is affordable and use is structured. This aligns with UNESCO's (2023) call for coherent institutional policies and with recent reviews emphasizing human oversight, professional development, infrastructure, and responsible integration.

Taken together, the findings support a shift from a prohibition-oriented response to a literacy-and-guidance approach. Since students are already using ChatGPT, institutions may gain more educational value by teaching students when and how to use it, how to verify outputs, how to disclose AI assistance where required, and how to retain responsibility for their own academic work. For Biology Education specifically, guided activities can require students to critique AI-generated biological explanations, identify inaccuracies, compare AI responses with scientific sources, and justify their final answers. Such approaches can position ChatGPT as an object of critical inquiry as well as a learning support tool.

Implications for Biology Teacher Education

The findings have several implications for Biology teacher education.

1. The high level of ChatGPT awareness and utilization suggests that AI literacy should become part of teacher education rather than being left to students' informal experimentation. Biology Education students need guidance on how to use ChatGPT appropriately for learning, research, content development, and other academic activities.
2. The findings on challenges, particularly inadequate internet access, high internet costs, lack of funds for digital devices, and limited access to training, highlight the need for institutions to improve students' access to digital learning resources. Affordable connectivity, reliable campus Wi-Fi, and opportunities for digital skills training can help make AI-supported learning more accessible.
3. The high level of agreement on the need to integrate ChatGPT into the curriculum and provide guided learning activities suggests that lecturers should provide structured opportunities for students to use generative AI. Rather than leaving students to learn through trial and error, lecturers can design activities that require students to use ChatGPT alongside their own knowledge, practical work, and independent reasoning.
4. The concerns about the accuracy of ChatGPT responses indicate the need to teach students how to evaluate and verify AI-generated information. In Biology, students should be encouraged to compare ChatGPT responses with textbooks, peer-reviewed literature, laboratory evidence, and other reliable sources. Students should also understand the difference between using AI as a learning aid and presenting AI-generated content as their own work.
5. Finally, the finding that rote or superficial use of ChatGPT was perceived as a challenge has implications for assessment practices. Biology teacher educators should design assessments that require explanation, application, practical evidence, reflection, problem-solving, and demonstration of individual understanding. Such approaches can reduce the educational value of simply submitting AI-generated responses and encourage deeper learning.

IMPLICATIONS FOR MATHEMATICS EDUCATION

The findings of this study have potential implications for Mathematics Education because the study addresses a broader issue: how undergraduate learners are becoming aware of and using generative AI for academic purposes.

These implications should therefore be understood as cross-disciplinary implications rather than direct findings about Mathematics Education students.

1. First, the high level of ChatGPT utilization reported by the respondents suggests that mathematics educators should recognize generative AI as an emerging part of students' learning practices. Students may use ChatGPT to request explanations of mathematical concepts, worked examples, alternative solution methods, practice questions, brainstorming assistance, and help with mathematical writing. Mathematics educators therefore need strategies for distinguishing productive AI-supported learning from the inappropriate replacement of students' own reasoning.
2. The concern about rote or superficial use of ChatGPT is particularly relevant to mathematics education. Mathematics learning involves more than obtaining a correct final answer; students need to understand procedures, justify their steps, interpret results, and apply concepts to unfamiliar problems. Mathematics educators could therefore use AI-generated solutions as objects of critique. For example, students could examine an AI-generated solution, identify an incorrect step, explain why it is incorrect, and produce a corrected solution. In this way, AI use can become an opportunity for mathematical reasoning rather than a substitute for it.
3. The respondents' concern about the accuracy of ChatGPT responses has direct relevance to mathematics learning. AI-generated responses may contain incorrect calculations, faulty reasoning, inappropriate assumptions, or convincing explanations of incorrect answers. Mathematics teacher education should therefore emphasize verification, estimation, logical checking, and comparison with established mathematical procedures. Future mathematics teachers should learn to treat AI-generated answers as claims that require evaluation rather than as unquestionable sources of mathematical knowledge.
4. The strong agreement on curriculum integration and guided learning activities suggests that mathematics education programmes could incorporate structured and transparent approaches to generative AI. For example, lecturers could design activities in which students compare their own solution with an AI-generated solution, evaluate different solution methods, improve an explanation, or use ChatGPT to generate practice problems that they subsequently solve independently. Such activities can support

mathematical communication and reflection while keeping students responsible for their own reasoning.

5. The strong demand for internet access and Wi-Fi highlights the equity dimension of AI-supported mathematics education. If access to generative AI depends heavily on students' ability to afford devices, data, or private internet connectivity, the benefits of AI-supported learning may not be equally available to all students. Mathematics teacher-education institutions should therefore consider equitable access alongside pedagogical guidance. Institutional support for connectivity should also be accompanied by clear guidance on responsible use, academic integrity, privacy, and verification of AI-generated content.

The cross-disciplinary implication is not that Biology Education and Mathematics Education are identical. Rather, the findings demonstrate a broader challenge facing subject-specific teacher education: preparing future teachers to work effectively in learning environments where students increasingly interact with generative AI. For mathematics education in particular, this preparation should combine AI literacy with mathematical reasoning, verification, ethical use, assessment redesign, and equitable access.

CONCLUSION

Undergraduate Biology Education students at the University of Nigeria, Nsukka demonstrated substantial awareness and high self-reported utilization of ChatGPT. Their use was concentrated on academic and productivity-related activities, especially content creation, academic research, education, assignments, brainstorming, and conversation practice. At the same time, students reported infrastructural, financial, technical, and AI-literacy challenges. The strongest perceived solutions centred on affordable internet access, free Wi-Fi, curriculum integration, guided learning, and monitoring of academic work.

Although the study was conducted with Biology Education students, these findings have wider relevance for Mathematics Education because mathematics learners are similarly required to reason, solve problems, evaluate solutions, and communicate mathematical ideas. The educational priority is therefore not simply to increase or restrict ChatGPT use, but to prepare learners and future mathematics educators to use generative AI critically, ethically, equitably, and in ways that preserve independent mathematical reasoning.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

1. Integrate AI literacy into teacher education programmes. Universities should incorporate structured instruction on the responsible and effective use of ChatGPT and other generative AI tools into Biology Education programmes. This should cover appropriate academic use, verification of AI-generated information, ethical use, and academic integrity.
2. Provide guided opportunities for ChatGPT use in teaching and learning. Lecturers should design learning activities that require students to critically engage with AI-generated responses rather than simply copy them. Students can be asked to evaluate, verify, correct, and improve AI-generated content as part of their learning activities.
3. Strengthen students’ digital literacy and critical evaluation skills. Teacher education programmes should equip students with the skills needed to assess the accuracy, relevance, and limitations of information generated by ChatGPT and other digital tools.
4. Improve access to internet connectivity and digital resources. Universities should provide affordable or free campus Wi-Fi and reliable internet access to support equitable participation in AI-supported learning. Where possible, support should also be provided for students who lack appropriate digital devices.
5. Provide regular training and workshops for students and lecturers. Institutions should organize practical training on the educational use of ChatGPT, including its benefits, limitations, ethical considerations, and appropriate applications in academic work.
6. Review assessment practices. Lecturers should adopt assessment strategies that emphasize explanation, application, problem-solving, practical activities, reflection, and demonstration of individual understanding. This can reduce overreliance on AI-generated answers and promote meaningful learning.
7. Develop institutional guidelines for responsible AI use. Universities should establish clear guidelines on the acceptable use of generative AI in teaching, learning, research, and assessment, including issues of academic integrity, privacy, authorship, and verification of AI-generated information.

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