

Knowledge and Utilization of Artificial Intelligence Tools among Undergraduate Students: Implications for Educational Technology Adoption

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ABSTRACT

Artificial Intelligence (AI) is increasingly integrated into higher education, yet its adoption among students in Ghana remains underexplored. This study investigated undergraduate students' knowledge, familiarity, and utilization of AI tools at the University of Ghana. A descriptive quantitative survey design was employed, with purposive sampling of 400 students (203 males, 197 females; ages 16–28). Data was collected via an online questionnaire and analyzed using descriptive statistics, cross-tabulations, and chi-square tests. Findings revealed that most respondents (93.5%) were aged 16–20, reflecting a youthful and digitally engaged population. In terms of AI knowledge, 40% defined AI as a technology enhancing learning and teaching, 37% as applications supporting problem-solving, and 23% as computer systems performing tasks. Familiarity levels were moderate for 54% of students, while 44.75% reported being familiar and 1.25% not familiar. Awareness was highest for ChatGPT (52.5%), followed by Snap AI (22.5%) and Meta AI (21.75%). Regarding usage, 53.25% reported frequent use of AI tools in academic research, 46.25% occasional use, and 0.5% no use. Students engaged critically with AI-generated responses, with 50% proofreading, 25% cross-checking, and smaller proportions editing (5%) or paraphrasing (4.5%). Chi-square analysis showed no significant gender difference in AI knowledge ($\chi^2 = 3.17$, $p = .205$), but a significant association between gender and AI usage ($\chi^2 = 9.84$, $p = .007$), with male students reporting higher frequency of use. These results highlight AI's growing role as an educational aid, while underscoring gaps in deep familiarity and gender disparities in usage. Expanding AI literacy programs and promoting inclusive digital engagement are recommended to optimize the benefits of emerging technologies in higher education.

Keywords: Artificial Intelligence, higher education, Ghana, digital literacy, technology adoption



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INTRODUCTION

Artificial Intelligence (AI) has emerged as one of the most transformative technologies of the twenty-first century, reshaping activities across education, healthcare, business, communication, and governance. The rapid advancement of generative AI technologies, particularly large language models such as ChatGPT, Gemini, Copilot, and Meta AI, has significantly altered how information is created, accessed, and utilized in educational settings. Universities worldwide are increasingly integrating AI-powered applications into teaching, learning, assessment, and academic support systems, creating new opportunities for enhancing educational effectiveness and learner engagement (Kasneci et al., 2023; Simos & Katsiampoura, 2025).

The growing adoption of AI in higher education reflects broader efforts to promote digital transformation and prepare students for participation in knowledge-based economies. AI technologies offer numerous educational benefits, including personalized learning experiences, adaptive instruction, intelligent tutoring, automated feedback, content generation, and improved access to learning resources. Recent evidence suggests that AI tools can enhance students' academic performance, foster independent learning, improve writing quality, and support research activities when used appropriately (Yamson et al., 2026; Simos & Katsiampoura, 2025). Furthermore, AI-assisted learning environments have been associated with increased learner motivation, efficiency, and engagement, particularly among digitally connected youth populations.

The emergence of generative AI has further accelerated the integration of AI into higher education. ChatGPT, for example, has gained widespread popularity among university students because of its ability to generate human-like responses, summarize information, explain complex concepts, assist with academic writing, and support problem-solving activities (Yamson et al., 2026). A recent study conducted in Ghana reported high levels of awareness and familiarity with ChatGPT among academic communities, highlighting its perceived usefulness in enhancing communication, collaboration, and learning processes within tertiary institutions (Yamson et al., 2026). These developments suggest that AI tools are becoming increasingly embedded in students' academic experiences and learning practices.

Despite the growing availability and accessibility of AI technologies, concerns remain regarding students' understanding and responsible use of these tools. Scholars have raised questions about overreliance on AI-generated content, academic integrity, data privacy, algorithmic bias, and the potential erosion of critical thinking skills (Kasneci et al., 2023; Matobobo, 2026). While AI offers significant educational advantages, effective utilization requires adequate digital literacy, ethical awareness, and the ability to critically evaluate AI-generated information. Consequently, understanding

students' knowledge and perceptions of AI has become an important area of inquiry for educators and policymakers seeking to maximize the benefits of technological innovation while minimizing associated risks. In developing countries, particularly within Sub-Saharan Africa, the adoption of AI in higher education presents both opportunities and challenges (Nyarko et al., 2025). Although internet penetration and digital technology use have increased considerably over the past decade, disparities in access to digital infrastructure, technological resources, and AI-related training continue to influence students' engagement with emerging technologies. Universities across the region are increasingly encouraging digital learning; however, empirical evidence on students' knowledge, familiarity, and utilization of AI tools remains limited. This knowledge gap is particularly important because students represent a generation that will increasingly rely on AI-driven technologies in their academic and professional lives. Recent studies have also highlighted the influence of demographic factors on AI adoption. For instance, Matobobo (2026), in a systematic review of gender differences in students' use of AI tools in higher education, found that male students generally reported higher levels of AI usage, confidence, and behavioural intention to use AI technologies than female students. Female students, on the other hand, demonstrated greater concerns regarding ethical considerations, privacy, and dependency on AI systems. These findings suggest that understanding gender-related patterns of AI adoption is essential for promoting equitable access to digital innovations in higher education. Within the Ghanaian context, the increasing availability of AI-powered applications presents a unique opportunity to enhance teaching and learning outcomes. However, there is limited empirical evidence regarding the extent to which undergraduate students understand, interact with, and utilize AI tools for academic purposes. Existing studies have primarily focused on educators' perspectives, institutional readiness, and general technology adoption, leaving significant gaps in knowledge concerning students' experiences with AI technologies. As higher education institutions continue to embrace digital transformation, understanding students' knowledge and utilization of AI tools is critical for developing effective policies, digital literacy initiatives, and responsible AI integration strategies.

Against this background, the present study examined undergraduate students' knowledge, familiarity, and utilization of AI tools at the University of Ghana. Specifically, the study sought to assess students' awareness of AI technologies, identify commonly used AI applications, examine patterns of utilization for academic purposes, and explore gender differences in AI adoption. The findings contribute to the growing body of literature on AI in higher education and provide insights for educators, policymakers, and institutional leaders seeking to promote responsible and effective use of AI technologies in Ghanaian universities.

LITERATURE REVIEW

Artificial Intelligence in Higher Education

Artificial Intelligence (AI) has become one of the most influential technological innovations shaping contemporary higher education. The emergence of generative AI applications such as ChatGPT, Gemini, Microsoft Copilot, and Meta AI have transformed the ways students access information, conduct research, generate content, and interact with learning materials. Universities worldwide are increasingly integrating AI-powered systems into teaching, learning, assessment, and academic support services to improve efficiency and enhance student learning outcomes (Sallam, 2024; Simos & Katsiampoura, 2025).

Recent studies indicate that AI technologies facilitate personalized learning by adapting instructional content to students' individual needs, learning pace, and performance levels. AI-powered educational tools also provide immediate feedback, automate routine academic tasks, and support collaborative learning environments (Chan & Hu, 2024).

According to Simos and Katsiampoura (2025), digital tools supported by AI have significantly improved inclusion, accessibility, and learner engagement in higher education settings by enabling flexible and student-centered learning experiences.

The rapid diffusion of generative AI has further accelerated AI adoption in higher education. Yamson et al. (2026) found that ChatGPT has become an increasingly valuable educational tool among university students, facilitating communication, collaboration, academic writing, and research activities. Their study demonstrated that students perceive AI-powered tools as useful for information retrieval, idea generation, and academic problem-solving, highlighting the growing integration of AI into everyday educational practices. These developments suggest that AI is no longer a supplementary technology but is becoming an integral component of higher education ecosystems.

Despite these benefits, concerns remain regarding the ethical and pedagogical implications of AI use in education. Scholars have identified challenges relating to academic integrity, overdependence on AI-generated content, misinformation, and algorithmic bias (Chan & Tsi, 2024; Sallam, 2024). Consequently, educational institutions are increasingly emphasizing responsible AI use and digital literacy as essential competencies for students in the digital age.

Knowledge and Understanding of Artificial Intelligence

Knowledge of AI refers to individuals' awareness, understanding, and conceptualization of AI technologies and their applications. Students' understanding of AI has become increasingly important as these technologies

become embedded in educational environments. However, evidence suggests that while many students are familiar with AI applications, their understanding of the underlying concepts remains limited (Chan & Hu, 2024).

Interestingly, recent research has shown that university students often conceptualize AI from a functional perspective rather than a technical one. For example, students commonly describe AI as a tool that assists learning, problem-solving, decision-making, and content generation rather than as computational systems that simulate human intelligence (Yamson et al., 2026). Such perceptions reflect the growing visibility of generative AI applications in educational contexts and suggest that students' understanding is largely shaped by their experiences using AI-powered tools. Similarly, Chan and Hu (2024) reported that although students generally possess positive perceptions of AI, many demonstrate only moderate levels of AI literacy and struggle to differentiate between concepts such as machine learning, deep learning, natural language processing, and generative AI. This finding underscores the need for structured AI education and digital literacy initiatives within universities to foster deeper conceptual understanding and responsible usage.

The increasing prevalence of AI technologies in higher education therefore requires institutions to move beyond promoting AI accessibility toward developing students' critical understanding of how AI systems function, their limitations, and their ethical implications.

Familiarity and Utilization of AI Tools among University Students

Familiarity with AI technologies is a significant predictor of technology adoption and usage behaviour. Students who are more familiar with AI tools are generally more likely to incorporate them into their academic activities. Research conducted across different higher education contexts indicates that exposure to AI technologies through coursework, peer interactions, and independent exploration increases students' confidence and willingness to use AI applications for learning purposes (Sallam, 2024).

The widespread popularity of generative AI tools has significantly increased students' familiarity with AI. ChatGPT remains the most recognized and frequently used AI application among university students globally. Recent studies indicate that students primarily use ChatGPT for information retrieval, summarizing academic materials, brainstorming ideas, language improvement, research assistance, and academic writing support (Yamson et al., 2026; Chan & Hu, 2024). In addition to ChatGPT, students increasingly engage with other AI-powered applications such as Gemini, Meta AI, Copilot, Grammarly, QuillBot, and adaptive learning systems. These tools offer functionalities ranging from automated writing support to personalized tutoring and content

generation. According to Yamson et al. (2026), students perceive these tools as enhancing productivity, improving learning efficiency, and facilitating collaborative learning processes. However, studies also reveal that students do not blindly accept AI-generated outputs. Many learners engage in verification behaviours such as proofreading, cross-checking information, and consulting additional sources before utilizing AI-generated content (Sallam, 2024). Such practices indicate a developing awareness of the limitations and potential inaccuracies associated with AI-generated information.

Gender Differences in AI Knowledge and Utilization

Gender differences in technology adoption remain an important area of inquiry within educational technology research. Although digital access has improved globally, disparities continue to exist in technology confidence, usage patterns, and perceptions of emerging technologies.

A recent systematic review by Matobobo (2026) found significant gender-related differences in students' use of AI tools across higher education institutions. The review revealed that male students generally reported higher levels of AI utilization, greater confidence in interacting with AI systems, and stronger behavioural intentions to adopt AI technologies. Female students, however, demonstrated greater concerns regarding ethical issues, data privacy, and overreliance on AI-generated content. These findings are consistent with broader technology adoption literature, which suggests that males often report higher levels of technology self-efficacy and willingness to experiment with new technologies. However, Matobobo (2026) emphasized that such differences are influenced by contextual factors including access to technology, prior exposure, educational opportunities, and institutional support rather than inherent gender characteristics.

Within the African context, empirical evidence regarding gender differences in AI adoption remains limited. Nevertheless, understanding potential disparities is important for designing inclusive AI literacy interventions and ensuring equitable access to emerging educational technologies.

Technology Acceptance Model (TAM) and AI Adoption

The Technology Acceptance Model (TAM), originally proposed by Davis (1989), remains one of the most widely applied frameworks for understanding technology adoption behaviour. TAM posits that individuals' intentions to use technology are primarily influenced by two factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Technologies perceived as useful and easy to use are more likely to be adopted and utilized.

Recent studies have successfully applied TAM to explain students' adoption of AI technologies in higher education. Research demonstrates that students are more

likely to use AI tools when they perceive them as enhancing academic performance, improving learning efficiency, and reducing the effort required to complete academic tasks (Chan & Hu, 2024). Similarly, Yamson et al. (2026) found that students' positive perceptions of ChatGPT's usefulness significantly influenced their continued use of the technology for learning and research purposes.

Furthermore, contemporary extensions of TAM recognize that technology adoption is influenced not only by perceived usefulness and perceived ease of use but also by external factors such as gender, digital literacy, social influence, institutional support, and prior technological experience (Venkatesh et al., 2003; Segbenya et al., 2024; Ofosu-Ampong, 2024). These variables are particularly relevant to AI adoption because students' familiarity, confidence, and perceptions of AI technologies shape their willingness to integrate these tools into their academic activities.

The relevance of the Technology Acceptance Model in explaining AI adoption is supported by the findings of Segbenya et al. (2024), who reported that students' perceptions of the usefulness and accessibility of AI technologies significantly influenced their academic utilization. Their findings reinforce TAM's proposition that individuals are more likely to adopt technologies that are perceived as beneficial and easy to use. The study further demonstrated that AI adoption contributes positively to academic productivity, highlighting the importance of students' perceptions in shaping technology acceptance behaviors.

Consequently, TAM provides a useful theoretical lens for examining undergraduate students' knowledge and utilization of AI tools. The model helps explain how students' perceptions of AI influence their usage behaviours and supports the investigation of demographic factors, such as gender, that may affect adoption patterns.

Research Gap

Although recent studies have documented increasing adoption of AI technologies in higher education, much of the evidence originates from North America, Europe, and Asia. Research examining undergraduate students' knowledge, familiarity, and utilization of AI tools in Sub-Saharan Africa remains limited. The rapid expansion of generative AI technologies has created an urgent need to understand how students conceptualize and utilize AI tools within diverse educational contexts. Addressing this gap is important for informing institutional policies, AI literacy programs, and responsible technology integration strategies. Despite the growing role of AI in higher education globally, limited empirical evidence exists on how undergraduate students in Ghana conceptualize and utilize AI tools, particularly with respect to gender differences. To address this gap, the present study was guided by the following objectives and hypotheses.

Research Objectives

The study was guided by the following objectives:

1. To evaluate undergraduate students' knowledge and conceptual understanding of Artificial Intelligence (AI) concepts.
2. To analyze the extent and patterns of AI tool utilization among undergraduate students.

Research Hypotheses

Based on the objectives, the following hypotheses were formulated:

- **H01:** There is no significant gender difference in undergraduate students' knowledge of AI.
- **H02:** There is no significant gender difference in undergraduate students' usage of AI.

METHODOLOGY

Study Design

This study employed a cross-sectional descriptive survey design to examine undergraduate students' knowledge, familiarity, and utilization of Artificial Intelligence (AI) tools at the University of Ghana. The design was considered appropriate because it enabled the collection of data from a large number of students at a single point in time, facilitating the assessment of prevailing patterns of AI awareness and usage among undergraduate students.

Study Population and Sampling Procedure

The study population comprised undergraduate students enrolled at the University of Ghana during the 2024/2025 academic year. A purposive sampling technique was employed to recruit participants who were currently enrolled as undergraduate students and had access to digital technologies required for participation in the study. Purposive sampling was selected because the study sought information from students who were likely to have encountered or interacted with AI-powered technologies in their academic activities. Additionally, the online mode of data collection necessitated targeting participants who were active users of digital communication platforms. While purposive sampling facilitated efficient access to relevant respondents, it limits the generalizability of the findings beyond the study sample. The possibility of selection bias cannot be ruled out because participants were recruited through online platforms and self-selected into the study. Future studies may consider probability-based approaches, such as stratified random sampling across colleges, academic

levels, and programmes of study, to improve representativeness and enhance the generalizability of findings. A total of 387 undergraduate students participated in the study and completed the questionnaire.

Participant Characteristics

The study sample consisted predominantly of younger undergraduate students, with 93.5% of respondents aged between 16 and 20 years. This age distribution reflects the typical age profile of undergraduate students entering Ghanaian universities immediately after completing secondary education. The predominance of younger students is important when interpreting the findings because younger individuals generally demonstrate higher levels of digital engagement, technology adoption, and willingness to experiment with emerging technologies such as AI tools. Consequently, the observed levels of AI familiarity and utilization may partly reflect the technological orientation of this age cohort. Additional demographic characteristics collected included sex, academic level, programme of study, and college affiliation. These variables were included to examine potential differences in AI knowledge and utilization across demographic groups.

Instrument Development and Validation

Data were collected using a structured questionnaire developed following a comprehensive review of the literature on AI literacy, technology adoption, and students' utilization of AI tools in higher education. Questionnaire items were informed by constructs commonly examined in previous studies on AI awareness, familiarity, perceived usefulness, and utilization of AI technologies among university students (Chan & Hu, 2024; Sallam, 2024; Yamson et al., 2026).

The questionnaire comprised four sections:

1. Demographic characteristics of respondents;
2. Knowledge and awareness of AI technologies;
3. Familiarity with specific AI applications and tools;
4. Utilization of AI tools for academic and learning-related activities.

To establish content validity, the instrument was reviewed by three experts in educational technology, research methodology, and higher education studies. Their feedback informed revisions relating to item clarity, relevance, and comprehensiveness. A pilot study involving 30 undergraduate students from a university with similar characteristics but outside the study setting was conducted to assess the clarity and reliability of the instrument. Data from the pilot participants were excluded from the final analysis. Internal consistency reliability was assessed using Cronbach's alpha coefficient. The overall reliability coefficient for the instrument scales was 0.70,

indicating good internal consistency and reliability of the instrument.

Data Collection Procedure

Data were collected electronically using an online questionnaire created through Google Forms. The survey link was distributed through official and informal student communication channels, including WhatsApp groups, student association platforms, and university-related online communities. Participants received information about the purpose of the study and were required to provide informed consent before proceeding to complete the questionnaire. The online approach facilitated broad geographical reach, rapid data collection, and convenience for participants. However, it may have introduced self-selection bias because students who are more digitally active, technologically inclined, or interested in AI-related topics were more likely to encounter and complete the survey. Consequently, the findings may overestimate AI familiarity and utilization among the broader undergraduate population. Future studies should consider combining online recruitment with face-to-face data collection methods to reduce potential selection bias and improve sample diversity.

Data Analysis

Data were exported from Google Forms and analyzed using the Statistical Package for the Social Sciences (SPSS), Version 29. Prior to analysis, data were screened for completeness, consistency, and accuracy. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' demographic characteristics, knowledge of AI, familiarity with AI tools, and utilization patterns.

Inferential analyses were conducted using Pearson's chi-square tests to examine associations between demographic variables and AI knowledge and utilization. Before conducting chi-square analyses, assumptions relating to the independence of observations and minimum expected cell frequencies were assessed. Specifically, no more than 20% of cells had expected frequencies below five, and no expected cell count was less than one, indicating that the assumptions for chi-square analysis were satisfied. Where statistically significant associations were observed, effect sizes were calculated using Cramer's *V* to assess the strength and practical significance of the relationships. Statistical significance was determined at $p < .05$. For statistically significant chi-square analyses, Cramer's *V* was computed to determine the strength of association. Effect sizes were interpreted using Cohen's (1988) guidelines, where values of 0.10, 0.30, and 0.50 represent small, medium, and large effects, respectively.

Ethical Considerations

The study adhered to internationally accepted ethical principles for research involving human participants as outlined in the Declaration of Helsinki (World Medical Association, 2013). Participation was entirely voluntary, and respondents were provided with information regarding the purpose of the study, the nature of their involvement, and their right to decline participation or withdraw from the study at any stage without penalty. Prior to data collection, the questionnaire and study procedures were reviewed by a panel of research and academic assessors to ensure the appropriateness of the research design, participant recruitment procedures, informed consent process, and confidentiality measures. Their feedback contributed to strengthening the ethical conduct of the study. Electronic informed consent was obtained from all participants before they completed the online questionnaire. No personally identifiable information was collected, and participants' anonymity and confidentiality were maintained throughout the study. Data were securely stored and used solely for research purposes. The study involved an anonymous online survey of university students and posed minimal risk to participants. The research was conducted in accordance with the ethical principles of respect for persons, beneficence, non-maleficence, justice, confidentiality, and voluntary participation as outlined in the Declaration of Helsinki.

RESULTS

The demographic information of respondents is presented in (Table 1). The ages of respondents ranged from 16 to 28 years, with the majority (93.5%) between 16–20 years. This indicates that most respondents were in their early years of tertiary education, reflecting the youth-dominated demographic of university populations. The gender distribution was fairly balanced, with 203 (50.7%) males and 197 (49.3%) females. Additionally, 78.8% of respondents were in their third and final years, suggesting that these students had more experience and exposure to AI tools in their academic journey.

Knowledge and understanding of AI Concepts

Respondents were asked to select the definition of Artificial Intelligence (AI) that best matched their knowledge and understanding. The responses showed varied conceptualizations. As presented in (Table 2), 23% viewed AI as a computer system capable of performing tasks, 40% considered it a technology that enhances learning and teaching experiences, and 37% described it as applications that assist with learning, decision-making, and problem-solving. This reflects a strong orientation towards AI as a supportive educational tool, consistent with Seo (2021), who defined AI as a system that enhances online learning through personalized experiences.

Table 1: Respondents Demographic Information.

Characteristics	Frequency	Percent (%)
Age		
16-20 years	374	93.5
21-25 years	24	6.0
26-28 years	2	0.5
Sex		
Male	203	50.7
Female	197	49.3
Undergraduate Student Level		
Level 100	41	10.3
Level 200	44	11.0
Level 300	98	24.5
Level 400	217	54.3
Faculty		
College of Basic and Applied Science	136	34.0
College of Education	56	14.0
College of Health Sciences	51	12.8
College of Humanities	157	39.3

Table 2: Respondents' definition of AI

Definition of AI	Frequency	Percentage (%)
A computer system that can perform tasks	92	23.0
A technology that enhances learning and teaching experiences	160	40.0
Applications that help with learning, making decisions and problem solving	148	37.0

Table 3: Respondents' Familiarity with AI

Familiarity Level	Frequency	Percentage (%)
Familiar	179	44.75
Moderately Familiar	216	54.0
Not Familiar	5	1.25

Table 4: Respondents' Awareness of AI Tools.

AI Tool	Frequency	Percentage (%)
ChatGPT	210	52.5
Meta AI	87	21.75
Snap AI	90	22.5
Quillbot	10	2.7
Gemini AI	3	0.75

Familiarity with AI

As indicated in (Table 3), more than half of the respondents (54.0%) reported being moderately familiar with AI, while 44.75% said they were familiar. Only 1.25% indicated not being familiar with AI. This suggests that most students have a foundational awareness of AI concepts, though not all possess deep understanding. This aligns with Wang et al. (2020), who found that while students recognize the term 'AI,' they often struggle to

distinguish between related concepts such as 'machine learning' and 'deep learning.'

Awareness of AI Tools

Table 4 presents respondents' awareness of different AI tools. The majority (52.5%) indicated awareness of ChatGPT, followed by Snap AI (22.5%) and Meta AI (21.75%). Only a few respondents mentioned Quillbot (2.7%) and Gemini AI (0.75%). The widespread recognition of ChatGPT aligns with its global adoption

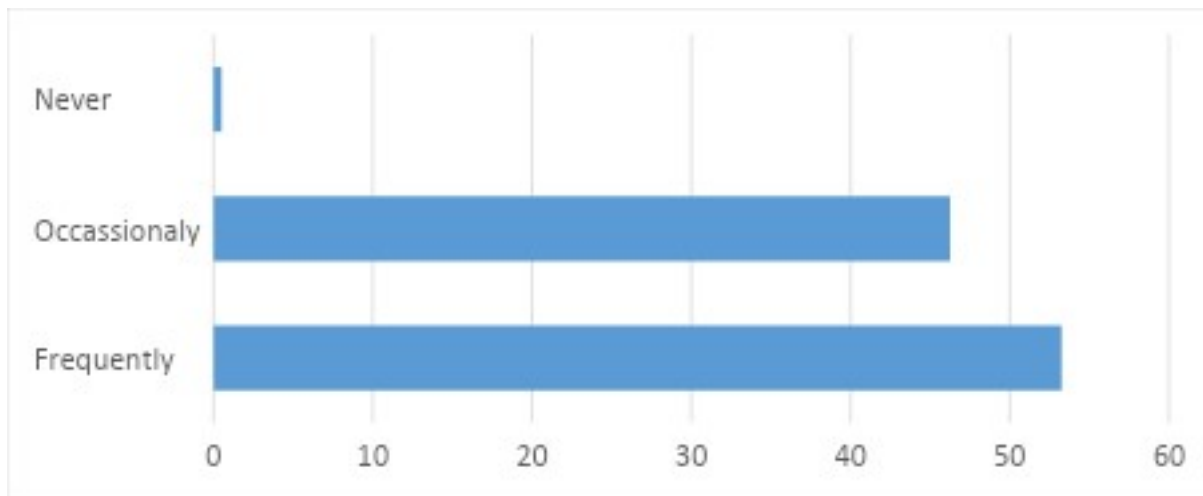


Figure 2: Extent of AI usage in academic research

Table 5: What Respondents did to the AI generated responses.

Responses	Frequency	Percentage (%)
Proofread	201	50.0
Paraphrase them	18	4.5
Edit them	20	5.0
Check with other source	98	25.0
Do not do anything to them	63	16.0
Total	400	100

following its release in November 2022. Meta AI's integration into social platforms such as Facebook and WhatsApp also enhances its visibility.

AI usage in academic research

Figure 1 illustrate the extent of usage of AI tools among respondents in the university of Ghana campus. Figure 1 showed that 213(53.25%) alleged that they frequently use AI in their academic study. One of the primary areas where AI is frequently used in education is personalized learning and adaptive instruction. AI-powered adaptive learning systems can analyze student performance data, identify individual learning needs, and tailor the content, pace, and delivery to each student's preferences and abilities. This personalized approach has been shown to improve student engagement, motivation, and learning outcomes. Another significant number of 185(46.25%) respondents held that they occasionally used AI in their academic work. These responses suggest that while AI is being implemented in various educational contexts, its usage is not consistent among the respondents. The occasional usage of AI in education may be influenced by the varying levels of comfort and familiarity that the respondents have. As AI continues to evolve and become more accessible, it is expected that the frequency of its usage in educational settings will increase. On the other hand, only 2 (0.5%)

respondents said that they never use AI in their academic work.

Respondents' utilization of answers from AI

Table 5 shows what respondents do to the answers from AI tools. When asked what respondents did to answers they got from AI, the study found that the majority of respondents (201 students) reported that they "proofread" the answers they receive from AI. This finding suggests that students recognize the need to critically evaluate the accuracy and reliability of the information provided by AI-based tools, rather than blindly accepting it. The literature on trust in AI-generated content emphasizes the importance of user engagement and verification as key factors in establishing trust and confidence in technology. Proofreading the AI-generated responses aligns with this concept, as it reflects a desire to actively validate the information and ensure its quality and relevance. Editing and Paraphrasing AI-generated Responses: A smaller proportion of respondents (20 and 18 students, respectively) reported that they "edit" or "paraphrase" the AI-generated responses they received. These actions indicate a more proactive approach to engaging with the AI-provided information, where students take the initiative to refine, personalize, or adapt the content to better suit their needs or preferences.

Table 6: Knowledge of AI by Gender.

Knowledge of AI	Male n (%)	Female n (%)	Total n (%)
A computer system that can perform tasks	49 (24.1)	43 (21.8)	92 (23.0)
A technology that enhances learning and teaching experiences	87 (42.9)	73 (37.1)	160 (40.0)
Applications that help with learning, decision-making, and problem-solving	67 (33.0)	81 (41.1)	148 (37.0)
Total	203 (100)	197 (100)	400 (100)

Table 7: AI Usage by Gender.

Use of AI	Male n (%)	Female n (%)	Total n (%)
Frequently	143 (35.75%)	70 (17.5%)	213 (53.25%)
Occasionally	145 (36.25%)	40 (10.0%)	185 (46.25%)
Never	1 (0.25%)	1 (0.25%)	2 (0.50%)
Total	289 (72.25%)	111 (27.75%)	400 (100%)

Table 8: Test of Association between Respondents' gender and their knowledge and Usage of AI.

Variable	χ^2	df	p-value	Cramer's V	Effect Size Interpretation
AI Knowledge	3.17	2	.205	0.09	Negligible
AI Utilization	9.84	2	.007*	0.16	Small

The questionnaire also revealed that a significant number of respondents (98 students) "check with other sources" to verify the accuracy and reliability of the AI-generated responses. This approach reflects a desire to triangulate the information and corroborate the findings from the AI-based tool with additional authoritative or peer-reviewed sources. The results revealed that a portion of respondents (63 students) reported that they do not do anything about the AI-generated responses they receive. This suggests that some students may have a higher level of trust in the accuracy and reliability of the AI-powered tools, or it could be they are just being lazy to validate the responses.

Cross-Tabulation between Male and Female Based on Knowledge of AI Tools

Table 6 presents respondents' knowledge of Artificial Intelligence (AI) among male and female undergraduate students at the University of Ghana. Findings show that 49 males (24.1%) and 43 females (21.8%) identified AI as "a computer system that can perform tasks." Additionally, 87 males (42.9%) and 73 females (37.1%) described AI as "a technology that enhances learning and teaching experiences." Furthermore, 67 males (33.0%) and 81 females (41.1%) perceived AI as "an application that helps with learning, decision-making, and problem-solving."

Overall, there was greater consensus among both groups that AI is a technology that enhances learning and teaching experiences ($n = 160$, 40.0%), while fewer students ($n = 92$, 23.0%) defined AI as a computer system that can perform tasks. These results support the null hypothesis that there is no significant gender difference in knowledge of AI among undergraduate students. Both male and female students generally recognize AI as an

evolving technological tool that supports academic and cognitive processes.

Cross-Tabulation between Male and Female Based on Usage of AI Tools

Table 7 illustrates the use of AI tools among male and female undergraduate students. Results indicate that 143 males (35.75%) and 70 females (17.5%) reported using AI *frequently*. A total of 145 males (36.25%) and 40 females (10.0%) indicated *occasional* use, while 1 male (0.25%) and 1 female (0.25%) reported *never* using AI.

The results demonstrate that male students tend to engage with AI tools more often than female students.

The results thus support the alternative hypothesis that gender differences exist in AI usage among undergraduate students, with male students demonstrating higher engagement with AI tools for academic and problem-solving purposes.

Hypothesis Testing

A Chi-square test of independence was conducted to assess whether there was a significant association between undergraduates' gender and their knowledge and usage of AI (Table 8).

AI Knowledge

A chi-square test of independence indicated no statistically significant association between gender and AI knowledge, $\chi^2(2, N = 400) = 3.17$, $p = .205$, Cramer's $V = .09$, suggesting a negligible association between gender and students' knowledge of AI.

AI Utilization

A statistically significant association was observed between gender and frequency of AI utilization, $\chi^2(2, N = 400) = 9.84$, $p = .007$, Cramer's $V = .16$. Although significant, the effect size was small, indicating that gender explained only a modest proportion of the variation in AI use among undergraduate students. A closer look at the descriptive results in table 7 showed that a higher proportion of males (35.75%) reported using AI frequently compared to females (17.5%), while similar patterns appeared for occasional use (36.25% males vs. 10% females). This suggests that male students are generally more active users of AI technologies in their academic work than their female counterparts.

DISCUSSION

This study examined undergraduate students' knowledge, familiarity, and utilization of Artificial Intelligence (AI) tools at the University of Ghana and explored whether gender differences existed in AI knowledge and usage. The findings indicate that AI technologies have become embedded in students' academic experiences, although differences remain in the extent to which students engage with these tools.

Knowledge and Understanding of AI

The study found that most students conceptualized AI as either a technology that enhances learning and teaching experiences (40%) or as applications that support learning, decision-making, and problem-solving (37%), while only 23% viewed AI primarily as a computer system capable of performing tasks. This suggests that students understand AI largely through its practical educational functions rather than through its technical foundations.

This finding is important because it demonstrates that undergraduate students are increasingly interacting with AI as users rather than as developers or technical specialists. Their understanding appears to be shaped by everyday exposure to AI-powered applications that assist with learning activities. The result supports recent evidence that students tend to view AI from a functional perspective, emphasizing its usefulness in completing academic tasks rather than its underlying computational mechanisms (Chan & Hu, 2024; Yamson et al., 2026). While such practical understanding may encourage adoption, it also suggests that students may possess limited knowledge of how AI systems operate, their limitations, and the ethical issues surrounding their use. The finding that over half of respondents reported being moderately familiar with AI indicates that awareness of AI technologies is widespread among undergraduate students. However, moderate familiarity also suggests that exposure does not necessarily translate into deep AI literacy. Universities may therefore need to move beyond

simply providing access to AI tools and focus on developing students' critical understanding of AI capabilities, limitations, biases, and ethical implications.

Awareness and Adoption of AI Tools

The study revealed that ChatGPT was by far the most recognized AI tool among respondents, with more than half of students identifying it as an AI application they knew. Awareness of Meta AI and Snap AI was considerably lower, while very few respondents reported familiarity with Gemini AI or QuillBot.

The dominance of ChatGPT reflects its rapid diffusion within higher education since the emergence of generative AI technologies. Its prominence among University of Ghana students suggests that generative AI has become a primary gateway through which students interact with AI. Recent studies have similarly reported that ChatGPT is the most widely used AI application among university students because of its ability to generate explanations, summarize information, assist with writing tasks, and support academic research (Sallam, 2024; Yamson et al., 2026).

The widespread awareness of ChatGPT has important implications for higher education. First, it demonstrates that students are already integrating AI into their learning practices regardless of whether formal institutional policies exist. Second, it highlights the need for universities to provide guidance on appropriate and ethical use of AI tools, particularly as students increasingly rely on them for academic support. Rather than attempting to restrict AI use, institutions may achieve better outcomes by teaching students how to use these technologies critically and responsibly.

Extent of AI Utilization in Academic Activities

A notable finding of the study was that 53.25% of respondents reported frequent use of AI tools for academic purposes, while 46.25% reported occasional use. Only a negligible proportion indicated that they never used AI.

These results suggest that AI has transitioned from being an emerging technology to becoming a routine academic resource for many students. The high level of utilization indicates that students perceive AI tools as useful in supporting academic work, which is consistent with the Technology Acceptance Model (TAM). According to TAM, technologies that are perceived as useful and easy to use are more likely to be adopted (Davis, 1989). The widespread use of AI tools observed in this study reflects students' recognition of the potential of these technologies to enhance academic performance through increased efficiency in task completion. The relatively high levels of AI utilization observed in the present study are consistent with findings reported by Segbenya et al. (2024), who found that AI adoption among higher education students was associated with improved academic productivity. They demonstrated that students increasingly rely on AI technologies to support learning,

research, information retrieval, and academic decision-making. Other research have similarly shown that university students use generative AI to support information retrieval, brainstorming, summarization, writing, and research activities (Chan & Hu, 2024; Nyarko et.al., 2025; Yamson et al., 2026). The present findings therefore indicate that students at the University of Ghana are participating in a broader global shift toward AI-assisted learning.

At the same time, the large proportion of occasional users suggests that adoption is not yet uniform. Differences in confidence, digital skills, trust in AI systems, internet accessibility, and perceptions of academic integrity may influence how frequently students use AI. Consequently, universities should provide structured opportunities for students to develop competencies that enable effective and responsible AI use.

Evaluation of AI-Generated Responses

An important finding was that most students did not accept AI-generated responses uncritically. Half of the respondents reported proofreading AI-generated outputs, while one-quarter cross-checked information with other sources before use. Only 16% indicated that they used AI responses without modification or verification.

This study's findings suggests that many students recognize that AI-generated content may contain inaccuracies, biases, or incomplete information. The tendency to verify and edit AI outputs demonstrates a level of critical engagement that is essential for responsible AI use in academic settings. Rather than replacing students' thinking processes, AI appears to be functioning as a support tool that students evaluate and refine before incorporating into their work. The finding aligns with recent evidence that students increasingly view AI as a complementary resource rather than an authoritative source of knowledge (Sallam, 2024). Such verification behaviours are encouraging because they indicate awareness of the limitations of generative AI and suggest that many students are developing the critical digital literacy skills required in AI-enhanced learning environments.

Nevertheless, the proportion of students who reported using AI-generated responses without modification remains concerning. This group may be vulnerable to misinformation, academic misconduct, or overreliance on AI technologies. Universities therefore have an important role in promoting critical evaluation skills and establishing clear guidelines regarding acceptable AI use in academic work.

Gender Differences in AI Knowledge and Utilization

The study found no statistically significant relationship between gender and knowledge of AI ($\chi^2 = 3.17$, $p = .205$).

Both male and female students demonstrated comparable understanding of AI concepts, suggesting that access to AI-related information and awareness is relatively similar across genders within the University of Ghana context.

This finding is significant because it suggests that gender-based disparities in awareness of AI may be diminishing as AI technologies become increasingly mainstream and accessible. Exposure to digital technologies, social media platforms, and AI applications may be providing similar opportunities for both male and female students to learn about AI. In contrast, a significant relationship was found between gender and AI utilization ($\chi^2 = 9.84$, $p = .007$), with male students reporting more frequent use of AI tools than female students. This indicates that while knowledge levels may be similar, patterns of actual adoption and usage differ between genders.

A possible explanation is that utilization is influenced not only by awareness but also by factors such as technological confidence, self-efficacy, perceived usefulness, and willingness to experiment with emerging technologies. Recent evidence suggests that male students often report higher confidence in using AI tools, whereas female students tend to express greater concerns about privacy, ethics, and dependence on AI systems (Matobobo, 2026). The findings therefore suggest that interventions aimed at increasing AI adoption should focus not only on knowledge acquisition but also on building confidence and creating supportive learning environments that encourage equitable participation across genders.

Implications for Higher Education

The findings have several implications for higher education institutions. First, the high levels of awareness and utilization indicate that AI technologies are already influencing students' learning experiences. Universities can no longer treat AI as a future issue; rather, AI literacy should become an essential component of undergraduate education.

Second, the moderate levels of familiarity observed among students suggest a need for formal AI literacy programmes that move beyond tool usage to include ethical considerations, critical evaluation of AI-generated content, data privacy, algorithmic bias, and responsible use practices. Third, the finding that students actively verify AI-generated information provides an opportunity for educators to build on existing critical evaluation behaviours. Teaching strategies should emphasize AI-assisted learning rather than AI-dependent learning, ensuring that students continue to develop analytical, problem-solving, and critical-thinking skills. Finally, the significant gender difference in AI utilization highlights the importance of inclusive digital learning initiatives. Universities should develop interventions that encourage equitable engagement with AI technologies and address barriers that may limit participation among certain student groups. Overall, the findings suggest that AI has become

an important component of students' academic lives. The challenge for higher education institutions is therefore not whether AI should be used, but how it can be integrated responsibly, ethically, and effectively to enhance learning outcomes while preserving academic integrity and critical thinking.

Implications for Higher Education

Curriculum Reform and AI Literacy

The moderate familiarity with AI suggests a pressing need for universities to incorporate AI-related content into curricula across disciplines. Institutions could design interdisciplinary AI literacy courses focusing on ethical use, critical thinking, and practical application. As Luckin et al. (2016) argue, understanding how AI functions and impacts learning is vital for future-ready graduates.

Pedagogical Innovation and integration of AI Tools

The positive perception of AI's benefits indicates potential for integrating AI-driven tools into teaching. Personalized learning systems, adaptive tutoring, and automated assessment which can enhance academic outcomes (Holmes et al., 2022). Lecturers can employ AI to identify learning gaps, provide real-time feedback, and support inclusive education. Also, given that over half of students use AI frequently, lecturers can leverage this interest by integrating AI applications into coursework, assessments, and research training. This can enhance engagement and bridge the gap between traditional and digital pedagogies (Holmes et al., 2022).

Policy and Ethical Guidelines

Policymakers in higher education should establish frameworks guiding AI use to prevent misuse, plagiarism, and overreliance. As UNESCO (2023) emphasizes, the ethical deployment of AI in education must ensure transparency, fairness, and accountability. Universities must establish clear guidelines for AI use in academic work, focusing on plagiarism prevention, data privacy, and responsible innovation. Policies aligned with UNESCO (2023) guidelines on ethical AI use in education will help foster trust and accountability.

Capacity Building

Universities should invest in capacity-building programs for students and faculty to enhance AI competence. Training workshops, hackathons, and collaborations with tech industries could empower both students and educators to use AI responsibly and innovatively.

Gender Inclusion in Technology Adoption

Since slight gender disparities exist, strategies that

encourage female participation in digital and AI-related activities should be prioritized. Scholarships, mentorship, and inclusive teaching practices could promote equitable AI engagement.

Conclusion

This study underscores the growing relevance of AI in higher education and the readiness of students to adopt AI tools for academic and personal development. While familiarity and awareness levels are promising, the depth of understanding and equitable access remain areas for improvement. The findings advocate for strategic institutional reforms to integrate AI literacy, ethical practices, and inclusive innovation into the framework for higher education.

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