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Research Article

Understanding the Benefits and Challenges of Using Artificial Intelligence Among Tertiary Students in a Developing Economy

Nana Yaa Nyarko [1*], Justice Owusu-Bempah, Hawah Hussein [2], Mary Ayiniboma Ayamba [3], Gifty Sefakor Gabienu [4], Dorcas Klu [5], Lydia Nyarkoa Mensah [6], Marilyn Naa Morkor Commodore [7], Diana Bilson [8], Ewoenam, Gabriella Adakanu [9], Kezia Onwona-Agyeman [10]

[1] *Department of Family and Consumer Sciences. Email: nyanyarko@ug.edu.gh*

[2, 3, 4, 5, 6, 7, 8, 9, 10] *Department of Family and Consumer Sciences*

**Corresponding author Email: nyanyarko@ug.edu.gh*

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ABSTRACT

The integration of Artificial Intelligence (AI) in tertiary education has significantly influenced students' learning experiences. This study explored the benefits and challenges of using AI tools among 400 tertiary students through an open-ended questionnaire designed to capture their perspectives. The findings reveal that AI tools provide substantial benefits, particularly in enabling students to study independently. The accessibility of AI-powered learning platforms allows respondents to engage with academic materials at their own pace, enhancing self-directed learning. Despite these advantages, students reported several challenges associated with AI tools. These include delays in responses, usage or search limits, topic deviation, biased answers, network challenges, and concerns regarding the accuracy of AI-generated content. Such issues may hinder the effective use of AI in academic settings, limiting its reliability as a primary learning tool. Additionally, students expressed awareness of the risks associated with over-reliance on AI. Key concerns include reduced critical thinking skills, the possibility of being flagged for plagiarism, and a growing sense of academic laziness due to AI's convenience.

The findings suggest that while AI serves as a valuable educational resource, its limitations and potential risks necessitate a balanced approach to its use. Educators and policymakers should focus on guiding students to leverage AI responsibly, ensuring that it complements rather than replaces critical thinking and academic integrity. Further research is recommended to explore strategies for mitigating AI-related challenges while maximizing its educational benefits.

Keywords: Artificial Intelligence, tertiary education, AI tools, benefits, challenges, academic integrity.

INTRODUCTION

Artificial Intelligence (AI) has firmly established itself in modern society, and humanity is still in the process of weaving it into the fabric of daily life. For successful integration, it is essential to grasp its core functions and use them to optimize human activities. When applied responsibly, AI has demonstrated considerable utility. Being a non-human, computer-based system, it relies on specific forms of input or instructions to generate optimal outputs tailored to human needs.

Within the realm of higher education, AI is increasingly shaping the academic landscape, especially for students in tertiary institutions. It supports personalized learning, automates assessments, and powers research through intelligent tools, all of which contribute to improved access and academic efficiency (Luckin et al., 2016). Learners benefit from real-time feedback, individualized learning pathways, and expanded research opportunities, creating a more dynamic and engaging learning environment (Holmes et al., 2019).

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Nevertheless, the adoption of AI is not without complications. Ethical concerns such as academic misconduct, overdependence on technology, and the protection of personal data have sparked widespread debate (Selwyn, 2019). Furthermore, unequal access to AI technologies may widen the educational gap between students from diverse socio-economic backgrounds, exacerbating digital inequality (Zawacki-Richter et al., 2019). To fully realize AI's promise in education, these obstacles must be carefully addressed.

This study explores both the opportunities and limitations of AI in tertiary education, focusing on its impact on students' academic achievements, critical thinking development, and general learning experience. By examining these dimensions, educators and learners alike can better adapt to the evolving presence of AI in higher learning environments.

Benefits of Artificial Intelligence in Education

AI-powered technologies offer promising benefits for both educators and learners, holding the potential to transform the global education landscape. One of the most significant advantages of AI in education is its ability to deliver personalized learning experiences (Emshack & Spector, 2020). Adaptive learning platforms, powered by AI, can analyze students' learning preferences, styles, and academic performance to tailor educational content, pacing, and delivery methods to individual needs (Zawacki-Richter et al., 2019; Graesser et al., 2005; VanLehn, 2011). This customized approach can enhance student engagement, boost motivation, and improve academic outcomes (Luckin et al., 2016).

Walkington and Bernacki (2020) highlight that personalized AI learning can also expand educational exposure by enabling access to a broader array of disciplines and fostering the development of diverse skill sets. Furthermore, AI can serve as a critical support mechanism when students are unable to attend physical classes. For instance, assistive AI technologies can aid learners with visual, auditory, or mobility impairments by offering inclusive and accessible learning environments (Duffy & Pekrun, 2007). Additionally, AI-powered translation and language tools help bridge language barriers, thereby improving resource accessibility for students from various cultural and linguistic backgrounds (Popenici & Kerr, 2017).

Beyond student benefits, AI can significantly increase the efficiency and effectiveness of teaching practices. Tools such as AI-driven chatbots and virtual assistants provide immediate responses to student queries, allowing educators to dedicate more time to essential tasks such as lesson planning, curriculum enhancement, and individualized student support (Popenici & Kerr, 2017). Moreover, AI can assist in developing more dynamic and creative assessment strategies (Chassignol et al., 2018; Chen et al., 2020).

As academic demands continue to rise, AI technologies can also play a role in supporting student well-being by reducing stress and promoting productivity. Morales-Rodriguez, Martinez-Ramon et al. (2012) argue that implementing effective strategies—such as those enabled by AI—can help students manage academic pressure and improve performance.

AI-based analytics and assessment tools streamline grading processes and provide detailed, data-driven feedback that identifies specific areas for improvement (Holmes & Noss, 2003). A practical example is the University of Ghana's use of Sakai, a learning management system. Sakai facilitates the distribution of learning materials, submission of assignments and tests, automated grading, announcements, and class discussions. Its integration has notably improved both teaching efficiency and the overall learning experience for students.

Challenges Associated with the Use of AI in Education

Although AI holds great promise in the educational sector, it also encounters a range of technological and pedagogical limitations. One of the primary concerns is the absence of human interaction, which AI cannot replicate at the same level as a human educator. For students who benefit from interpersonal engagement, this lack of emotional and relational depth can be a disadvantage. Research by D'Mello et al. (2014) found that learners who engaged with virtual tutors simulating human-like emotional behavior achieved better outcomes than those who interacted with emotionless systems.

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Another major limitation is AI's reliance on data-driven algorithms, which often lack genuine comprehension of the concepts they teach. Because generative models function by identifying statistical patterns in data, their explanations may fail to address students' individual misunderstandings or specific learning needs. Wang et al. (2021) observed that AI-driven tutoring systems struggled to deliver explanations tailored to students' conceptual errors.

Bias in AI systems is another critical issue. Since these models are trained on existing datasets, any bias present in the data can be perpetuated by the AI itself. For instance, Bolukbasi et al. (2016) showed that a generative language model trained on a vast internet dataset exhibited gender bias in its outputs. This highlights how AI responses are limited by the quality and diversity of their training data, which can restrict originality and creativity.

Further evidence from Ziegler et al. (2019) revealed that generative AI models failed to produce original and varied musical compositions, indicating a limited ability to grasp context and situational appropriateness. These limitations can result in AI-generated responses that are irrelevant or unsuitable (Kocaguneli et al., 2010; Gao et al., 2019). Similarly, Baidoo-Anu and Owusu Ansah, (2023) cite Ribeiro and Vala, (2020) as concluding that although tools like ChatGPT could offer general academic assistance, they fall short in delivering instruction tailored to the specific needs of individual learners.

Statement of the Problem

The integration of Artificial Intelligence (AI) into education has significantly reshaped the learning landscape, particularly in higher education. AI-driven tools support personalized instruction, flexible learning schedules, and access to extensive academic content. While AI usage is rapidly expanding across educational systems worldwide, its deployment in developing countries presents distinct challenges that merit exploration.

Issues such as limited digital infrastructure, inconsistent internet access, and a lack of advanced AI technologies can restrict students' ability to benefit fully from AI-enhanced learning. Despite the growing dependence on AI for academic tasks, there is a scarcity of research exploring how tertiary students in developing economies perceive, adopt, and interact with these tools.

This gap in empirical evidence makes it difficult to assess the true educational impact of AI in these contexts. It is unclear how well students understand the risks associated with AI use, what obstacles they face, and how much value they derive from AI-assisted learning. Without this understanding, educators, policymakers, and institutions lack the insights necessary to create effective strategies that promote ethical and productive AI integration.

This study aims to investigate both the advantages and limitations of AI use among tertiary-level students in a developing country. It specifically seeks to:

1. Examine the benefits AI offers to undergraduate students.
2. Identify the challenges they encounter in using AI and how they coped.

METHODOLOGY

Research Design

This study employed a quantitative research approach, adopting a descriptive survey design to examine the perceived benefits and challenges of Artificial Intelligence (AI) use among undergraduate students.

Study Location

The research was conducted at the University of Ghana, situated in the Ayawaso West Wuogon Constituency of the Greater Accra Region. The institution was selected due to its large and diverse student population, which provided a representative sample for the study. As Ghana's premier liberal arts institution, the university operates a collegiate system and has a cosmopolitan student body, making it a suitable context for this research.

Sample Size and Sampling Technique

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A sample of 400 undergraduate students was selected using Cochran's formula for sample size determination in large populations, ensuring a 95% confidence level and a ±5% margin of error. The study targeted all students enrolled at the University of Ghana's main campus.

A stratified sampling technique was used to ensure adequate representation across the various colleges. Students were grouped into four strata based on their colleges: Humanities, Basic and Applied Sciences, Health and Allied Sciences, and Education. Within each stratum, participants were selected using convenience sampling, based on their availability and willingness to participate. To facilitate data collection, permission was sought from college authorities, and student course representatives assisted in sharing the survey link.

Ethical Considerations

Participation in the study was entirely voluntary. Respondents were informed about the purpose of the research, and confidentiality and anonymity were strictly maintained. No personal identifiers were collected, and informed consent was sought prior to survey completion.

Instrument

A structured questionnaire with close ended questions was developed to gather data on students' experiences with AI—focusing on perceived benefits and encountered challenges. The questionnaire was hosted on Google Forms and distributed online via social media platforms (WhatsApp, telegram etc) managed by college and departmental student bodies to ensure broader reach and accessibility.

Pretesting

Prior to the main data collection, the instrument was pilot-tested with 20 students from a comparable university. This pre-test helped identify and resolve ambiguities, ensuring clarity and reliability of the questionnaire items. In addition, qualitative responses were subjected to content analysis. Responses were read multiple times by the researchers to identify recurring patterns. Similar codes were then grouped under broader thematic categories and summarized into themes. These themes were then used as possible answers for the final questionnaire.

Data Analysis

Responses were securely downloaded in Excel format and password-protected. The data were then coded and imported into IBM SPSS Statistics (version 29) for analysis. Descriptive statistical methods—including frequencies and percentages—were used to analyze quantitative data and presented in tables and charts.

Benefits of AI Tools to Respondents' Studies

The benefits stated by respondents were a myriad but this section's focus is keyed to whether or not they perceived AI help them study. Three hundred and thirty-seven (84.25%) respondents believed AI helped them study on their own, and 63 (15.74%) respondents reported that AI does not help them study on their own. It is not surprising that a large percentage of the respondents believed it guided them to study independently. According to Atarah et al. (2023), the use of AI in higher Education has grown significantly in the country over the past decade and is likely to continue to do so as AI capabilities improve, and universities become more comfortable with adopting and integrating the technology into their academic and administrative processes. AI in higher education can provide many benefits for both students and teachers. It could be leveraged to promote personalized learning among students (UNESCO, 2019). Students can boost their own interest in learning with the assistance of AI technology. For example, the Learning Management Systems (LMS) Sakai – used at the University of Ghana provides the platform for students to receive their course/ lecture notes, articles, feedback on assessment and course outline to help students plan their learning before and after class.

Challenges Faced When Using AI Tools

Table 1, displays the various challenges the respondents face when using AI tools.

The most prominent challenge identified by the students was delays in the response from AI-powered systems, with 217 out of 400 respondents citing this as a significant concern. This finding is consistent with the existing research,

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which has highlighted the potential for AI-driven tools to experience latency or slow response times, particularly in high-demand or resource-constrained environments (Rao & Verweij, 2017). Such delays can disrupt the flow of learning, frustrate students, and undermine the effectiveness of AI-assisted instruction.

A smaller subset of students (9 out of 400) expressed concerns about the limitations in terms of usage or search capabilities of AI-powered tools. This challenge is also reflected in the literature, where researchers have noted that certain AI systems may have restrictions on the amount of content they can generate, the number of queries they can handle, or the scope of information they can access (Popenici & Kerr, 2017). These limitations can constrain the ability of students to fully leverage the potential of AI in their learning process.

Table 1: Challenges faced when using AI

Challenges	Frequency	Percentage (%)
Delays in responses	217	54.25
Bias answers	103	25.75
Deviation from topic	26	6.50
Network challenges	24	6.00
Usage / search limit	9	2.25
No challenges	21	5.25
Total	400	100

Source: Field Data, 2024

The survey also revealed that 26 out of 400 students were concerned about AI-generated responses deviating from the intended topic or failing to address the specific question or task at hand. This challenge is well-documented in the literature, as AI systems may sometimes struggle to maintain contextual relevance or exhibit a lack of true understanding of the underlying concepts (Bryson, 2018). This can lead to responses that fail to provide the desired information, potentially undermining the educational value of the AI-assisted experience. A significant number of students (103 out of 400) expressed concerns about the potential for AI-powered systems to provide biased answers. Bias can be influenced by the data used for training or the inherent biases of the developers (Ferrarra, 2024). Such biases can lead to the propagation of misinformation, the reinforcement of harmful stereotypes, or the marginalization of certain perspectives, all of which can hinder the educational process. Twenty-four (24) out of 400 students were concerned about network-related challenges, such as connectivity issues or technical glitches that could disrupt the smooth integration of AI-powered tools into the learning environment. Implementation of AI in education often relies on robust and reliable technological infrastructure, which may not always be available or consistently maintained (Rao & Verweij, 2017) especially in a developing economy. There was still a small fraction, 21 out of 400 students who did not perceive any significant challenges in the use of AI in education. This is suggestive that a large portion of the student population may be more receptive to the integration of AI-powered tools and technologies, potentially due to their familiarity with the technology or their confidence in the ability of AI to enhance their learning experience.

Accuracy of AI answers

Figure 1 illustrates the confidence respondents had on the accuracy of answers they get from using the AI tools. Three hundred and nineteen (319) students (the majority) reported moderately trusting the accuracy of the answers AI provided. This suggests that while students recognize the potential of AI-powered tools, they still maintained a cautious attitude towards the reliability of the information generated by these systems. In the educational context, the moderate trust in Al accuracy may be attributed to the relative newness of Al-powered technologies in this domain, as well as concerns about the potential biases and limitations inherent in Al systems.

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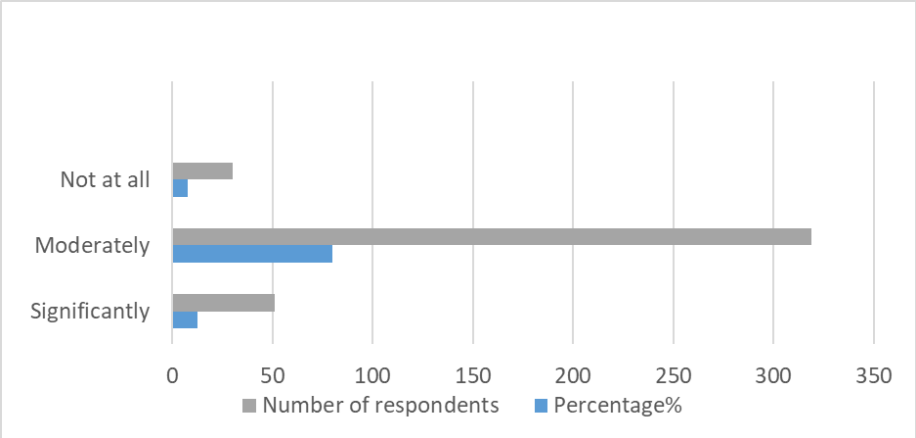

Figure 1. Accuracy of AI answer

Source: Field Data, 2024

Students may be wary of fully relying on Al-generated answers, particularly in high-stakes academic situations, without a deeper understanding of the underlying algorithms and decision-making processes (Zawacki-Richter et al., 2019). The trust in accurate answers provided by Al in contrast, a smaller proportion of the study's respondents (51) reported that they "trust" the accuracy of the answers provided by Al. This finding suggests that more than 75% the proportion of students have a higher level of confidence in the reliability and accuracy of Al-generated information. 30 respondents reported that they do not trust the accuracy of the answers AI provides. The low level of trust in Al accuracy may be influenced by the specific Al-based tools and applications these students used in the educational context. Students may have varying levels of trust depending on the perceived transparency, reliability, and effectiveness of the Al-powered technologies they encounter.

Respondents' Concerns about AI Answers

Figure 2 illustrates respondents' concerns about AI providing the same answers to multiple people. The findings indicate that there is a range of concerns regarding AI providing the same answers to multiple people. Forty-nine (49%), are "very concerned" about this issue. This suggests that many people see potential risks or downsides to AI systems giving same responses to multiple people.

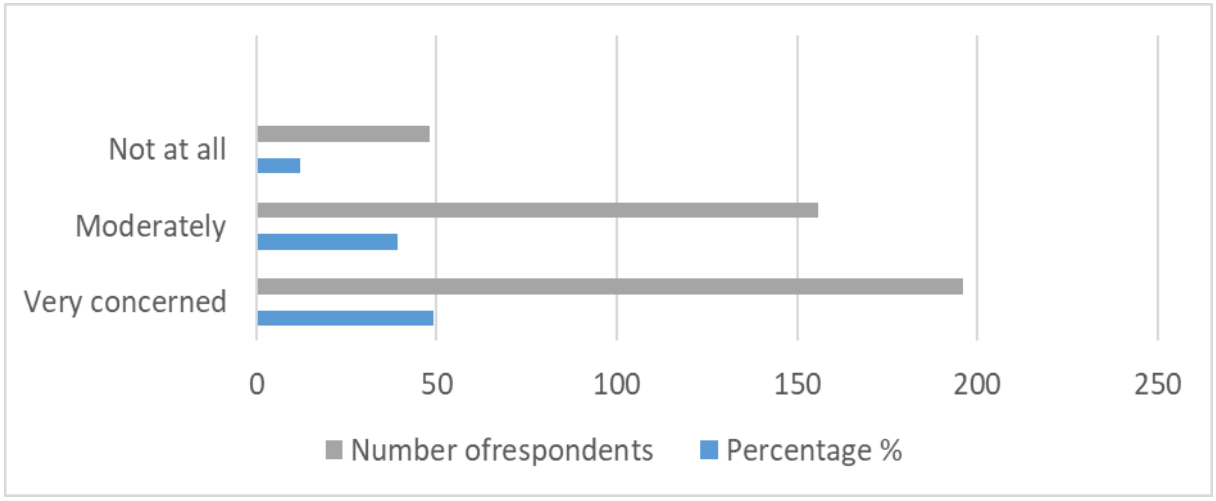

Figure 2. Respondents' concerns about AI providing same answers

Source: Field Data, 2024

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The concern around AI providing the same answers lend support to the potential for AI systems to perpetuate biases or mistakes if they are trained on limited or biased data (Mehrabi, Morstatter, Saxena, Lerman, & Galstyan, 2021). If an AI model is trained on a dataset that does not capture the full diversity of human perspectives and experiences, it may provide answers that are skewed and thereby unfairly favour certain groups over others. This could lead to the reinforcement of harmful stereotypes or the exclusion of minority viewpoints. Additionally, there are concerns that AI-generated responses, if overly standardized, could reduce human agency and the ability for personalized, contextual interactions (Bryson, 2018). People may feel that their individual needs are not being adequately addressed if an AI system provides a "one-size-fits-all" response, thereby undermining trust and satisfaction among users.

On the other hand, the 12% of respondents who were "not concerned" about this issue may appreciate the consistency and reliability that standardized AI responses can provide. In a customer service domain for instance, users may value clear, accurate information quickly, even if the response is not personalized (Følstad & Skjuve, 2019). Additionally, some users may prefer the objectivity and lack of bias that a well-designed AI system can offer, compared to potentially inconsistent or subjective human responses.

The 39% of respondents who were "moderately concerned" may reflect a more balanced perspective, recognizing both the potential benefits and drawbacks of AI providing the same answers to multiple people. This middle ground suggests that there may be ways to strike a balance, where AI systems can provide reliable and consistent information, while still allowing for a degree of personalization and contextualization (Kasirzadeh & Smart, 2021).

Risks Involved in Relying Heavily On AI

From the results in table 2, there appears to be significant concern among the students about the risks on relying too heavily on AI tools. Most respondents, 376 out of 400, expressed their belief that there are substantial risks associated with a dependence on AI-driven tools. One of the primary concerns raised by the students was the potential for AI to diminish critical thinking and problem-solving skills. As Zawacki-Richter et al. (2019) highlighted, there is a fear that the use of AI-generated content or AI-assisted learning could undermine the development of essential cognitive abilities, which are crucial for academic and personal growth.

Table 2: Respondents' perceived risks on relying heavily on AI

Reasons	Frequency	Percentage (%)
Reduce critical thinking skills	108	27.0
Over reliance on AI tools	55	13.75
Flagged for plagiarism	121	30.25
Makes me lazy	63	15.75
I don't think there is any risk	15	3.75
Prevent me from doing extensive research	13	3.25
Prevent me from attending lectures	11	2.75
It depends on how you use it	7	1.75
No reason	5	1.25
It is of great help to me	2	0.50
Total	400	100

Source: Field Data, 2024

Additionally, students expressed concerns about the risk of plagiarism. As Amigud and Arnedo-Moreno (2020) had documented, the availability of AI-generated text or AI-assisted writing could make it easier for students to pass off AI-generated content as their own, potentially leading to a rise in academic dishonesty.

Another area of concern raised by the students was the potential for AI to foster laziness and a lack of motivation. Bryson (2018) observed that an over-reliance on AI-powered tools could lead to a diminished sense of personal responsibility and initiative, as students become overly dependent on the technology.

Moreover, a small number of students expressed worries that heavy reliance on AI could discourage them from conducting extensive research or engaging actively with course materials, as they may become dependent on the information provided by AI systems (Popenici & Kerr, 2017). While majority of the students expressed concerns about the risks of over-reliance on AI in education, a smaller group (24 out of 400) believed that there was no significant risk as long as it was mitigated through the responsible use of the technology. Indeed the key is a balanced and thoughtful approach to the integration of AI (Zawacki-Richter et al., 2019; Popenici & Kerr, 2017) in higher education. Emphasis should be on the importance of using AI to enhance and complement human-led instruction and learning, rather than replacing it entirely.

CONCLUSION

This study's findings underscore the dual impact of Artificial Intelligence (AI) tools in higher education. While AI offers substantial benefits, particularly in fostering self-directed learning and allowing students to progress at their own pace, several challenges remain. These challenges include delayed responses, search limitations, topic deviations, biased outputs, network disruptions, and concerns regarding the accuracy of AI-generated information. These factors undermine the potential of AI to function as the sole academic resource for students.

Moreover, students recognize the risks associated with over-relying on AI, such as diminished critical thinking, plagiarism concerns, and a decline in independent learning skills. Although AI continues to serve as a valuable tool in education, its usage should be complemented by critical thinking and human oversight to preserve academic integrity and support intellectual development.

Recommendation for Future Research

To address the challenges identified in this study, future research may focus on strategies to enhance the effectiveness and accessibility of AI tools in tertiary education. Specific areas for further investigation include:

1. *Improving AI Accuracy and Reliability*: Research should aim to refine AI systems to produce more accurate and unbiased responses, reduce topic deviations, and minimize the spread of misinformation.
2. *Digital Literacy and AI Training*: Investigating the impact of structured AI literacy programs on students could help ensure responsible AI use, allowing students to maintain critical thinking skills while benefiting from AI's advantages.
3. *AI and Academic Integrity*: Studies should explore the role of AI in detecting plagiarism and the ways in which ethical AI use can be promoted to safeguard academic honesty.
4. *Infrastructure and Accessibility*: Addressing network limitations and improving search functionality will be crucial for ensuring equitable access to AI tools, especially for students in less digitally connected regions.
5. *Comparative Studies*: Conducting comparative research on AI-assisted learning versus traditional methods will provide valuable insights into the long-term effects of AI integration on student outcomes.

By addressing these research areas, future studies can play a pivotal role in shaping policies and practices that optimize the responsible use of AI in higher education, ensuring it serves as a complementary tool for academic growth.

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