Original Research Article

Examining the Role of Generative AI in Academic Integrityand Learning Outcomes: A Case Study of SelectedUniversities in the Upper East Region

ABSTRACT

This research paper examines the impact of Generative Artificial Intelligence (AI) on academic integrity and learning outcomes in selected universities in the Upper East Region. With the growing prevalence of AI technologies, particularly Generative AI, in educational settings, concerns have emerged regarding its influence on students' academic practices and performance. This study adopts a case study approach to investigate the use of Generative AI among students, its implications for academic integrity, and its effects on learning outcomes. Data collection methods consist of interviews, surveys, and the analysis of academic records. The findings shed light on the challenges and opportunities associated with the integration of Generative AI in higher education and provide recommendations for promoting responsible AI usage while upholding academic standards.

Keywords: Generative AI; academic integrity; learning outcomes; higher education; Upper East Region.

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1. INTRODUCTION

The rapid evolution of Artificial Intelligence (AI) technologies has led to widespread adoption across various sectors, including education [1, 19]. One notable advancement is Generative AI, which can autonomously create content. However, this raises concerns about its impact on academic integrity and learning outcomes in higher education institutions [3]. This paper aims to examine the role of Generative AI in selected universities in the Upper East region, specifically focusing on how it affects students' academic practices and performance.

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While Generative AI has the potential to enhance educational experiences, there are growing concerns about its misuse. The main issue is the potential erosion of academic integrity when students dishonestly use AI-generated content for assignments, research papers, and other academic tasks [15, 26]. Additionally, there is uncertainty about whether Generative AI promotes deeper understanding and retention of knowledge or merely aids in the superficial completion of academic requirements [8].

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This study explores the deployment of Generative AI in academic settings to understand its influence on traditional educational paradigms. It investigates how students interact with AI-generated content and examines the ethical dimensions surrounding its use in assignments, research papers, and learning materials. Furthermore, the research aims to assess whether Generative AI enhances or undermines students' academic integrity and learning outcomes in the region's higher education institutions. Through comprehensive analysis and empirical investigation, this paper aims to provide insights

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that will inform policies and practices for the responsible integration of Generative AI in educational contexts.

2. RELATED WORKS

Generative Artificial Intelligence (AI) is rapidly transforming higher education, presenting both exciting opportunities and significant challenges across various domains. Recent studies have extensively explored this impact. For instance, [28] highlight how Generative AI tools like ChatGPT are redefining teaching and learning dynamics in distance education. Their research underscores the potential of AI to promote responsible use and support student-centered initiatives [14]. Qualitative methods using interviews and focus groups [5] have been crucial in capturing diverse stakeholder perspectives on integrating AI into educational settings.

Studies have shown that Generative AI can enhance pedagogical practices[19]. AI's ability to deliver personalized learning experiences, automate assessments, and facilitate content creation not only improves educational outcomes but also fosters collaboration, communication, and AI literacy among educators and students [11]. [24] further demonstrate this by proposing AI-driven tools for customizable learning experiences, which effectively engage students through varied learning materials and self-assessment tools, leading to increased study time and better learning outcomes.

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However, the widespread adoption of AI tools like ChatGPT also raises significant ethical considerations in academic contexts.[12] explores how AI challenges traditional notions of plagiarism and academic integrity. Issues surrounding data privacy, transparency, and the balance between AI assistance and human oversight are critical considerations in maintaining academic standards while leveraging AI's capabilities [17]. [22] delve into global university policies on AI and academic integrity, advocating for comprehensive strategies like the 3E Model. This model aims to enhance assessment practices and guide ethical AI use in higher education [25].

The positive impact of AI extends beyond academic achievement.[13] examines AI's influence on student cognitive development in Arab higher education, highlighting positive outcomes achieved through AI techniques and applications. Their findings, supported by Structural Equation Modeling (SEM-PLS), reveal significant improvements in student learning experiences.

In response to potential drawbacks, [10, 15]propose modified flipped learning as a solution. This approach integrates AI for pre-class activities while emphasizing human input, thereby balancing automation with critical thinking development. Looking beyond academia, AI-based transformation projects are demonstrably enhancing organizational performance across various sectors [20, 29]. These projects drive efficiency, innovation, and competitive advantage in business operations.

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Table 1. Literature Comparison

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Author|Year	Focus	Key Findings

Sevnarayan et al., (2024)	Examines the role of GenAI in higher education, focusing on its impact on distance education, academic integrity, and student voices in a South African open distance and e-learning university.	Highlights the need to balance AI's challenges with its potential to enhance student engagement and learning outcomes. Emphasizes the necessity of ongoing exploration and strategic development to address ethical concerns and leverage AI for educational improvement.
Kruger-Roux et al., (2024)	Investigates GenAI's transformative effects on distance education, emphasizing its impact on academic integrity and student voices. Uses qualitative methods for insights.	Aims to bridge the gap between negative perceptions of AI and its potential benefits. Underscores the importance of responsible AI use, promoting student-centered initiatives and fostering engagement while addressing ethical issues.
Chan et al., (2023)	Explores GenAI's integration into educational practices using qualitative data collection to understand its impact.	Provides a balanced understanding of GenAI's role in education by addressing concerns regarding academic integrity and potential benefits. Offers recommendations for ethical AI integration to align with educational goals.
Perera et al., (2023)	Investigates how GenAI can enhance personalized learning, automated assessments, virtual assistants, and content creation in higher education.	Emphasizes the importance of ethical considerations such as data privacy and transparency. Advocates for the responsible use of AI to support academic integrity and improve learning experiences while promoting AI literacy among students and educators.
Nikolopoulou et al., (2024)	Focuses on ChatGPT's role in higher education, highlighting its potential to transform teaching and learning through personalized learning and other applications.	AI tools like ChatGPT can enhance teaching and learning practices, promote collaboration, communication, and inclusivity. Ethical considerations, including data privacy and transparency, are crucial for responsible AI use. AI should complement human oversight to maintain academic integrity.
Pesovski et al., (2024)	Proposes a method for personalizing learning materials using GenAI, integrated into a learning management system.	Diverse learning material formats and AI-generated quizzes improve student engagement and self-assessment. However, results have limited generalizability due to the small sample size. Highlights GenAI's potential to enhance personalized learning.
Lund et al., (2023)	Discusses the impact of GenAI on academic writing and plagiarism, comparing actual AI usage with educators' awareness.	Reveals a gap between actual AI usage and educators' awareness. Suggests revising writing curricula to address AI's role, emphasizing the need for human evaluation to ensure academic integrity. AI should enhance, not replace, critical thinking

		and writing skills.
Hutson et al., (2024)	Investigates the challenges and opportunities presented by AI-generated content in academic settings.	Calls for new frameworks to address originality and plagiarism issues in the AI era. Educators should guide students in using AI effectively and responsibly, ensuring AI enhances academic integrity and creativity. Highlights the need for human analysis to verify AI-generated content.
Bin-Nashwan et al., (2023)	Reviews articles and policies from top universities to understand the impact of GenAI on academic integrity.	Identifies themes of enforcing academic integrity, educating stakeholders about ethical AI use, and promoting GenAI for productivity. Proposes a 3E Model to improve academic integrity and assessment practices while exploring effective GenAI tool usage.
Jaboob et al., (2024)	Focuses on the integration of GenAI in Arab higher education, examining its impact on students' cognitive achievement and behavior.	Finds that GenAI positively affects cognitive achievement and highlights the importance of student behavior in enhancing this relationship. Contributes to the literature by providing evidence from the Arab region and offers insights for improving educational outcomes through AI.
Gilson et al., (2023)	Proposes a modified flipped learning model to mitigate the negative impacts of GenAI on education.	Suggests using GenAI for pre-class activities and content creation to balance automation with human input. Addresses ethical and practical concerns related to GenAI, aiming to enhance student engagement and learning outcomes. Calls for further research to evaluate the model's effectiveness.
Wamba-Taguimdje et al., (2020)	Analyzes the influence of AI on firm performance through a review of case studies and literature.	Identifies the significance of AI-enabled projects in enhancing organizational performance and creating business value. Highlights the importance of AI technologies for competitiveness, efficiency, and innovation. Provides insights into the impact of AI on various industrial sectors and organizational effectiveness.

3. METHODOLOGY

This study utilizes a case study approach focusing on selected universities in the Upper East region, namely C. K. Tedam University of Technology and Applied Sciences, Bolgatanga Technical University, and Regentropfen University College. The research methodology employs multiple data collection methods to gain comprehensive insights into the impact of Generative AI on academic integrity and learning outcomes.

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3.1Research Design

This study utilizes a case study approach that explores in-depth how Generative AI affects academic integrity and learning outcomes within specific educational contexts.

3.2Study Scope and Target Population

The scope of this study is limited to examining the role of Generative AI on academic integrity and learning outcomes in higher education institutions in the Upper East region. The target population includes students and faculty members from C. K. Tedam University of Technology and Applied Sciences, Bolgatanga Technical University, and Regentropfen University College. These institutions were selected due to their diverse academic programs and varying levels of AI technology adoption, providing a comprehensive overview of the impact of Generative AI on different educational contexts.

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3.3Sampling Technique and Size

A purposive sampling technique will be employed to ensure that the sample includes individuals with experience using Generative AI tools and who can provide relevant insights. The sample size will consist of approximately 150 participants, with 50 individuals selected from each university. This sample size is chosen to ensure sufficient representation and to facilitate meaningful comparisons between the different institutions [2].

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To determine the appropriate sample size, Cochran's formula for sample size calculation will be used:

$$n_o = \frac{Z^2.p.(p-1)}{e^2}$$

where:

- n_o is the initial sample size.
- Z is the Z-value corresponding to the desired confidence level (e.g., 1.96 for 95% confidence).
- p is the estimated proportion of the population with the attribute of interest (commonly 0.5 for maximum sample size).
- e is the margin of error (e.g., 0.05 for ±5% precision).

For a finite population, the adjusted sample size n is calculated as:

$$n = \frac{n_o}{1+\left(\frac{n_o-1}{N}\right)}$$

where:

- n is the adjusted sample size.
- N is the population size.

For this study, the sample size will consist of approximately 150 participants, with 50 individuals selected from each university to ensure sufficient representation and facilitate meaningful comparisons.

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3.4Data Collection

- **Interviews**: Conducting interviews with students and faculty members to gather qualitative perspectives on the integration of Generative AI in educational practices.

- **Surveys**: Administering surveys through the use of questionnaires to assess students' attitudes towards the utilization of AI technologies in academic settings. These surveys will explore perceptions, concerns, and experiences related to AI in education.
- **Analysis of Academic Records**: Analyzing academic records to quantitatively examine the correlation between the implementation of AI tools and technologies and students' learning outcomes. This analysis will focus on academic performance metrics such as grades, progression rates, and educational achievements.

3.5Data Analysis Techniques

- **Thematic Analysis**: Qualitative data from interviews and open-ended survey responses will be thematically analyzed to identify recurring themes and patterns in participants' perceptions and experiences.
- **Statistical Analysis**: Quantitative survey data and academic records will undergo statistical analysis to examine relationships and trends between Generative AI adoption and academic performance. Descriptive statistics and inferential tests will be employed as appropriate.

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The combination of qualitative insights from interviews and quantitative data from surveys and academic records will provide a comprehensive understanding of the role of Generative AI in academia within the Upper East region. This approach aims to illuminate both the challenges and opportunities associated with AI integration in higher education, contributing to broader discussions on educational technology and pedagogical practices.

3.5.1 Mathematical Formula for Correlation Analysis

The Pearson correlation coefficient $r$is calculated using the formula:

$$r = \frac{\sum(x_i - \bar{x})\,(y_i - \bar{y})}{\sqrt{\sum(x_i - \bar{x})^2 \sum(y_i - \bar{y})^2}}$$

Where:

- x and y are the individual sample points.
- $\bar{x}$ is the mean of the x values.
- $\bar{y}$ is the mean of the y values.
- $\sum$ denotes the summation.

Interpretation of Pearson's Correlation Coefficient

- $r = 1$: Perfect positive linear relationship.
- $r = -1$: Perfect negative linear relationship.
- $r = 0$: No linear relationship.
- $0 < r < 1$: Positive linear relationship.
- $-1 < r < 0$: Negative linear relationship.

3.6Tools

The study will employ a variety of tools to facilitate data collection and analysis.

- **Google Forms** will serve as the primary tool for designing and distributing questionnaires to both students and faculty members. It will also be used to collect and organize responses in a systematic manner.
- **Python programming language** will be employed for data analysis and visualization tasks. Python's robust libraries such as Pandas, NumPy, and Matplotlib will enable the processing of survey data, including cleaning, transforming, and analyzing both qualitative and quantitative responses. Python's flexibility allows for customized analysis tailored to the study's specific research questions, ensuring thorough exploration of correlations, trends, and patterns within the collected data. By integrating Google Forms for data collection and Python for advanced analysis and visualization, the study aims to leverage the strengths of both tools to derive meaningful insights and conclusions effectively[2, 4].

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4. RESULTS AND DISCUSSION

This section presents the findings of our investigation into the impact of Generative Artificial Intelligence (AI) on academic integrity and learning outcomes in three selected universities within Ghana's Upper East Region: C. K. Tedam University of Technology and Applied Sciences, Bolgatanga Technical University, and Regentropfen University College. A purposive sampling technique was employed to recruit 150 participants (50 from each university) with experience using Generative AI tools, ensuring diverse representation across demographics. The participants included:

Table 2. Demographic Profile of Survey Participants

Demographic	Category	Percentage
Gender Distribution	Male	60%
	Female	40%
Age Range	18-24 years	45%
	25-34 years	35%
	35-44 years	15%
	45 years and above	5%
Academic Level	Undergraduate	70%
	Postgraduate	30%
Field of Study	Computer Science	30%
	Engineering	25%
	Business	20%
	Humanities and Social Sciences	15%
	Other	10%

4.2 Organization of Findings

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The findings explore:

- **Student Utilization:** Patterns of Generative AI use for academic tasks such as assignments, research papers, and project work.
- **Perceptions:** Student and faculty attitudes towards the benefits and concerns surrounding Generative AI in educational settings.
- **Outcomes:** Potential correlations between Generative AI use and student academic performance metrics.

The results are organized into three key sections:

- **Qualitative Findings:** Insights gleaned from interviews and open-ended survey responses, revealing themes and patterns in participants' experiences and perspectives.
- **Quantitative Findings:** Analysis of data from surveys and academic records, providing statistical evidence on Generative AI use and its potential relationship with learning outcomes.
- **Integrated Discussion:** A combined analysis of both qualitative and quantitative findings, offering a comprehensive understanding of the multifaceted role Generative AI plays in the Upper East Region's higher education landscape.

This multi-faceted approach allows us to explore the nuances of Generative AI's impact, fostering a deeper understanding of its implications for academic integrity, learning practices, and educational policy in this specific educational context.

4.3 Qualitative Data: Thematic Analysis

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4.3.1 Attitudes toward Generative AI

Many students expressed a positive attitude towards Generative AI, highlighting its potential to streamline academic tasks. One student from the Computer Science department mentioned, "Generative AI tools like ChatGPT have significantly reduced the time I spend on initial research, allowing me to focus more on analysis and interpretation."

However, some students and faculty members voiced more cautious attitudes. A student from the Business department stated, "While AI helps in generating content quickly, I worry that it might make me lazy and overly dependent on technology." Similarly, a professor from the Humanities and Social Sciences department noted, "While AI can aid in generating content, there's a risk that students might not develop critical thinking skills if they depend too much on these technologies." Concerns were also raised about the potential for AI to produce biased outputs, which could mislead students and hinder independent learning.

4.3.2 Perceived Benefits

Students reported several benefits of using Generative AI in their academic work. For instance, an engineering student stated, "AI tools help in generating multiple design iterations quickly, which is particularly useful in project-based learning." Faculty members also acknowledged the advantages, with one business professor commenting, "Generative AI can assist in creating more dynamic and engaging learning materials, which can cater to different learning styles."

4.3.3 Concerns and Ethical Issues

Ethical concerns were a significant theme in the interviews. A postgraduate student expressed worry about data privacy, saying, "I am concerned about the confidentiality of the information I input into these AI systems." Faculty members echoed these concerns, with one stating, "There needs to be clear guidelines on how to use AI ethically to prevent academic dishonesty. Students might use AI to generate entire essays, which raises questions about originality and integrity."

To address these concerns, faculty members suggested incorporating AI literacy into the curriculum, emphasizing the ethical use of AI tools, and implementing robust plagiarism detection systems. These solutions could help mitigate concerns about data privacy and the development of critical thinking skills.

4.4 Quantitative Data: Statistical Analysis

4.4.1 Survey Results

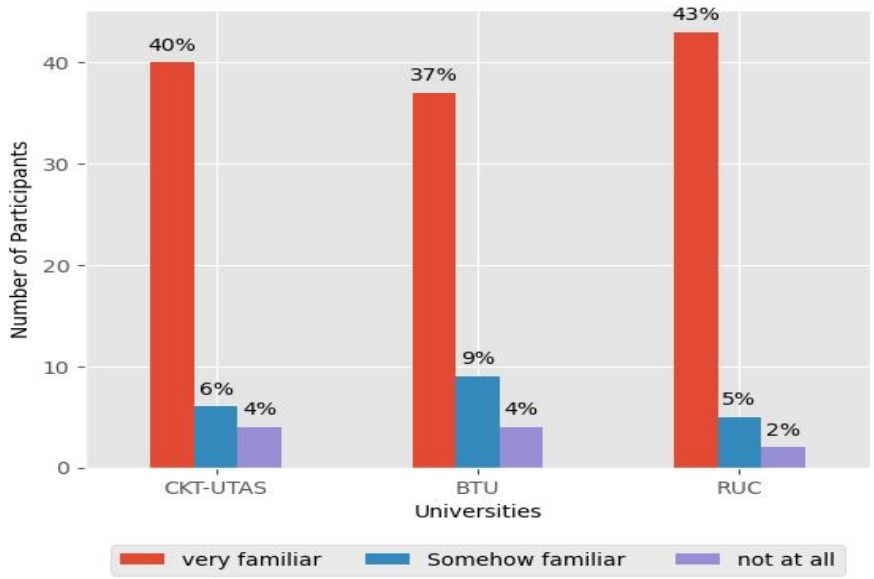

Fig. 1. Familiarity with the Concept of Generative AI

Fig. 1. shows analysis of students' familiarity with a Generative AI study at three universities reveals that out of 150 students, 120 (80%) are very familiar, 20 (13.3%) are somewhat familiar, and 10 (6.7%) are not familiar with the study. This indicates a generally high level of familiarity, with most students demonstrating strong or moderate understanding.

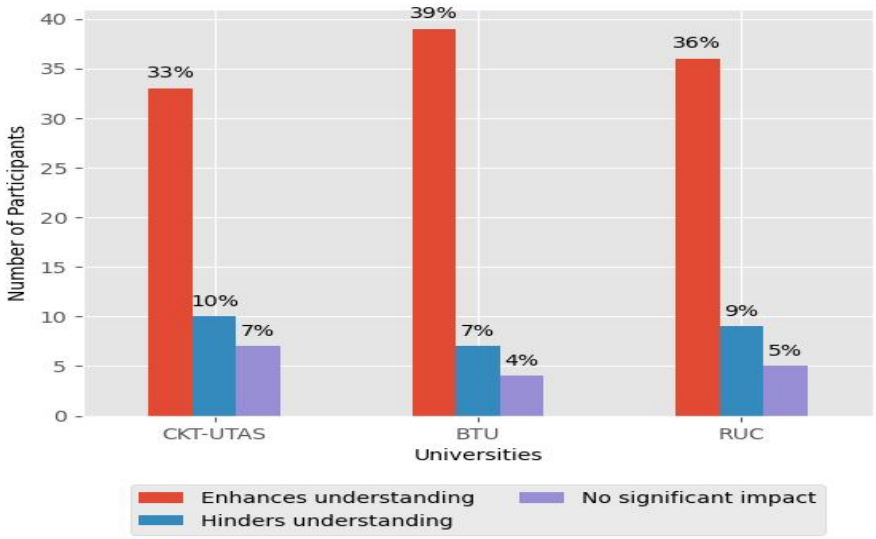

Fig. 2. Impact of Generative AI on Student Understanding

Fig. 2. Reveals that among 150 students from three universities, 108 (72%) reported having a better understanding, 26 (17.3%) reported having a hindered understanding, and 16 (10.7%) reported no significant impact. This indicates an overall positive effect on comprehension, as the majority of students experienced an improvement in their understanding of the study material.

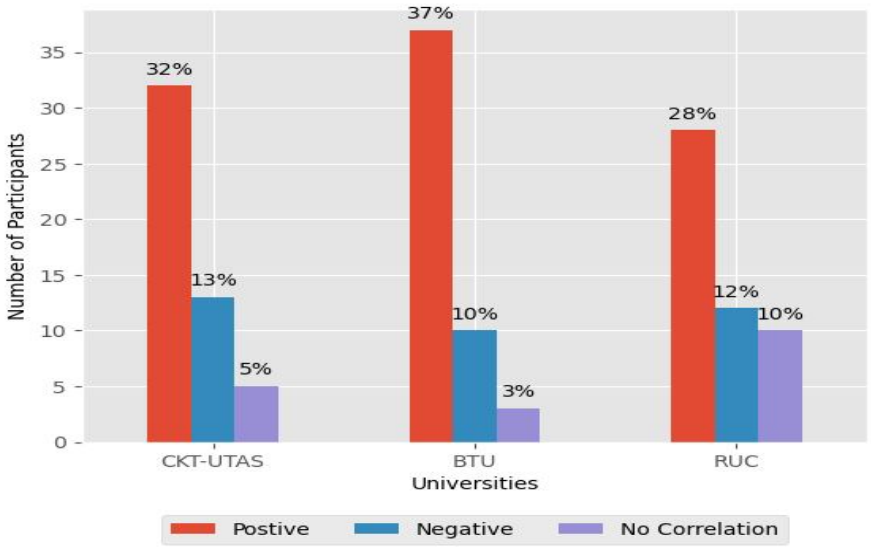

Fig. 3. Perceived Correlation between Generative AI Use and Academic Performance

Fig. 3. Shows different opinions on the impact of Generative AI on academic performance. Out of the participants, 97 (64.7%) believe it has a positive effect, 35 (23.3%) perceive a negative effect, and 18 (12%) report no significant impact. These findings suggest a majority in favour of a positive impact, while also noting dissenting and neutral perspectives.

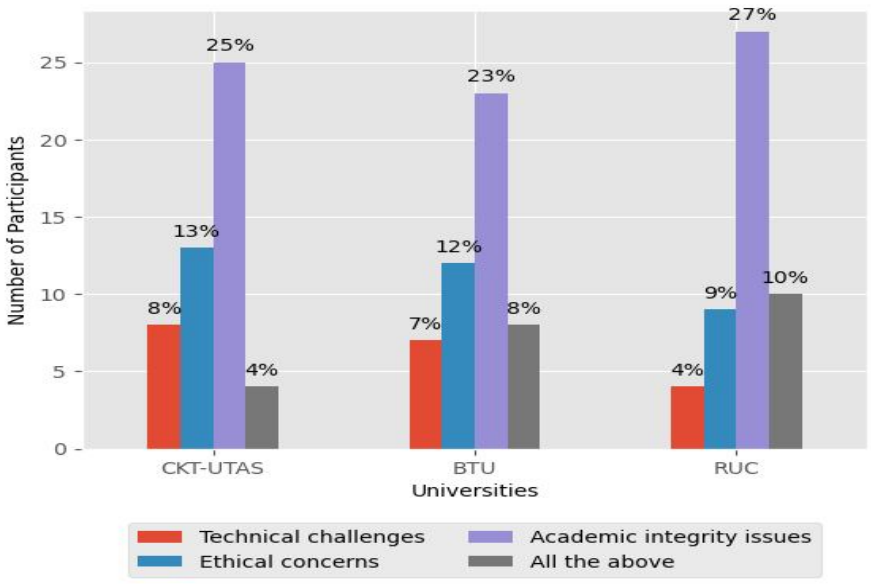

Fig. 4. Challenges in Integrating Generative AI into the Curriculum

Fig. 4. Reveals key challenges in integrating Generative AI into the curriculum: 19 reported Technical Challenges, 34 cited Ethical Concerns, 75 highlighted Academic Integrity Issues, and 22 selected all of the above. These findings indicate significant hurdles, emphasizing the need for professional development, clear guidelines, and further research to ensure effective and responsible integration of Generative AI in education.

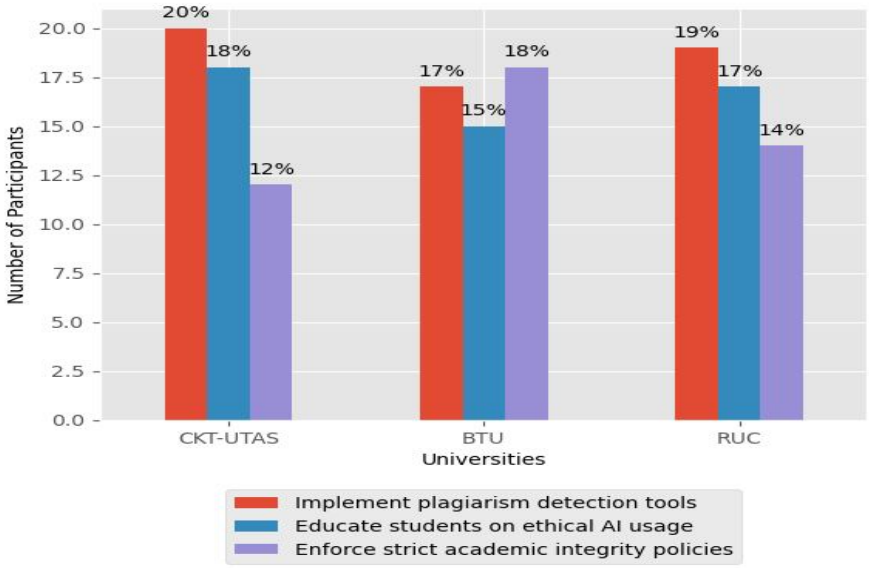

Fig. 5. Academic Integrity Concerns with Students' Use of Generative AI

Fig. 5. Shows instructors' preferences for addressing academic dishonesty with Generative AI: 56 favour plagiarism detection tools, 50 support educating students on ethical AI usage, and 44 endorse strict academic integrity policies. This highlights balanced concerns across strategies and a slight preference for detection tools, emphasizing the need for a comprehensive approach.

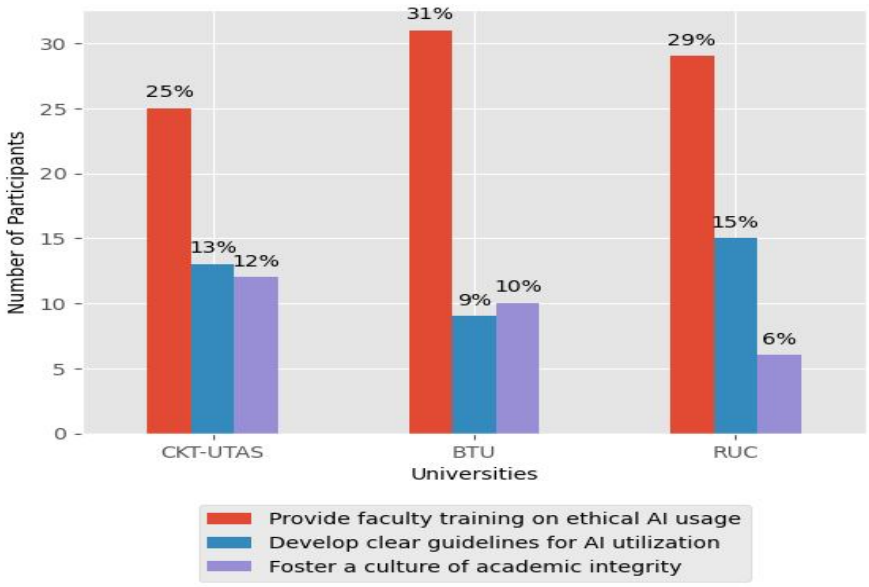

Fig. 6. Measures to Address Challenges of Generative AI Usage in Universities

Across universities, faculty members have different priorities when it comes to addressing challenges in Generative AI (see Fig. 6). The majority of faculty, 56.7%, consider training on ethical AI usage as highly important. The next priority, at 24.7%, is developing clear guidelines, followed by fostering a culture of academic integrity, noted by 18.7%. These varying priorities illustrate the diverse strategies employed by universities in managing the impact of Generative AI on academic practices.

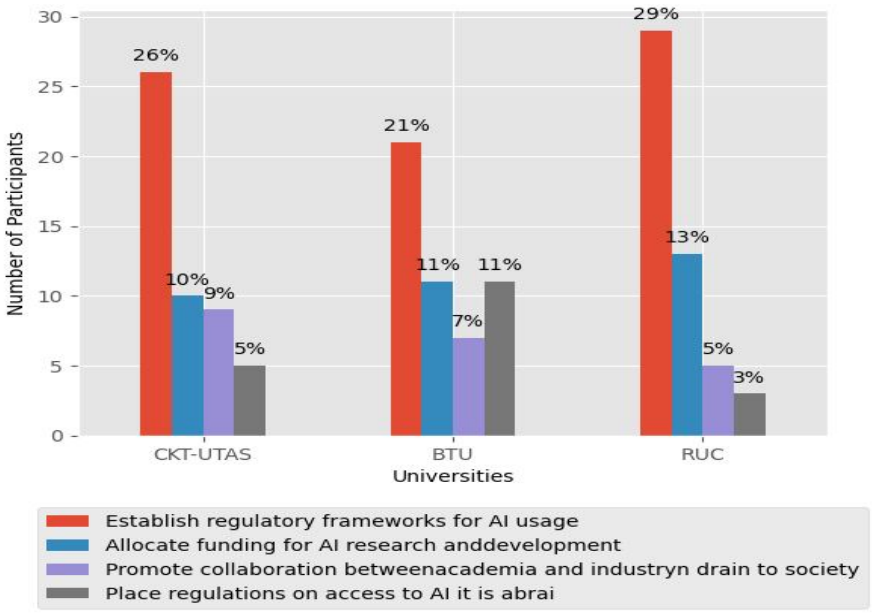

Fig. 7. Supporting Responsible Integration of Generative AI in Higher Education

Fig. 7 shows participant endorsements for different strategies. The strategy that received the most support, with 26 participants, is establishing regulatory frameworks for AI usage. Allocating funding for AI research and development is the next highest, with 10 participants. Promoting collaboration between academia and industry had 9 participants, while placing regulations on access to AI was endorsed by 5 participants. The total endorsements for each strategy are 76, 34, 21, and 19, respectively, indicating that establishing regulatory frameworks is the most favored approach.

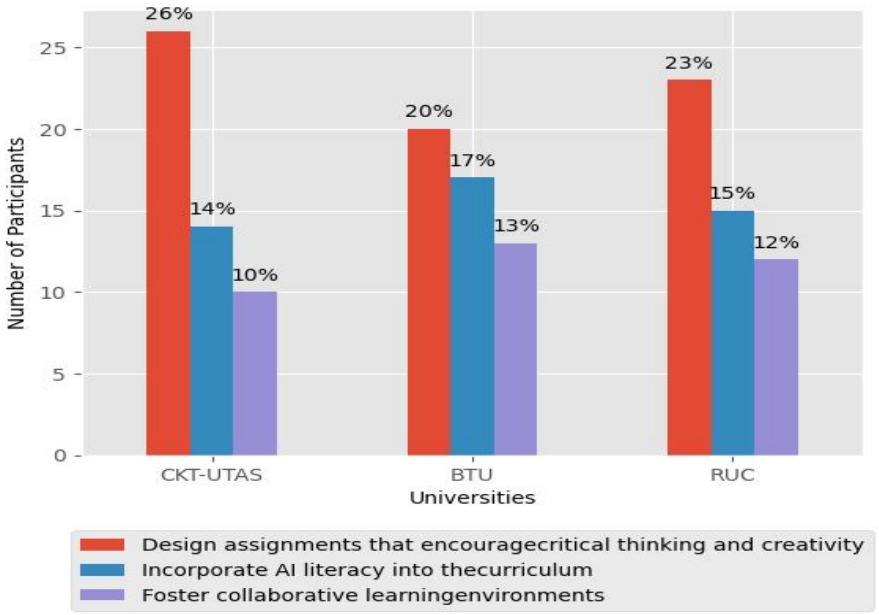

Fig. 8. Educator Strategies for Utilizing Generative AI

Fig. 8 shows the total endorsements across all universities for various strategies. These strategies include designing assignments that encourage critical thinking and creativity, which received 69 endorsements (69%), incorporating AI literacy into the curriculum with 46 endorsements (46%), and fostering collaborative learning environments with 35 endorsements (35%). This analysis highlights a strong preference for assignments that enhance critical thinking and creativity among the universities.

To analyse the survey data, we used a Chi-Square test to assess the relationship between the usage of AI tools and their perceived impact on learning. Furthermore, we employed a t-test to compare the academic performance of students who frequently used AI tools with those who did not use them. The statistical analysis was conducted using the Python programming language, specifically utilizing libraries such as pandas for data processing and analysis.

4.4.2 Academic Performance Analysis

A statistical analysis of academic records showed a correlation between AI tool usage and improved grades. Specifically, students who frequently used Generative AI tools had an average GPA increase of 0.3 points compared to those who did not. The correlation coefficient (r) calculated was 0.45, indicating a moderate positive relationship between AI usage and academic performance.

4.3 Integration of Findings

The qualitative and quantitative data consistently highlighted the positive impact of Generative AI on learning efficiency and academic performance. While students appreciated the convenience and faculty recognized the potential for enhanced learning materials, both groups acknowledged the need for ethical guidelines. The integration of these findings underscores the importance of balanced AI usage, combining technological benefits with the cultivation of critical thinking skills.

Limitations

It is important to note some limitations of this study. Potential self-reporting bias in student surveys could affect the accuracy of the data. Additionally, the performance analysis is based on short-term academic records, which may not fully capture the long-term impact of Generative AI on learning outcomes.

4.4 Consistent Themes across Data Types

Across both qualitative and quantitative data, the theme of "enhanced learning efficiency" was prominent. Students frequently mentioned that AI tools saved time and improved the quality of their work, which was supported by survey data showing high usage rates and positive perceptions. Additionally, the concern for academic integrity emerged as a consistent theme, with both students and faculty emphasizing the need for ethical use of Generative AI in educational settings.

4.5 Implications for Academic Integrity

The findings reveal significant implications for academic integrity in the context of Generative AI use. Both students and faculty expressed concerns about the potential for academic dishonesty. The ease with which AI tools can generate essays and complete assignments raises questions about the originality of student work. For example, students might misuse AI to generate entire essays without proper citation, making it difficult for traditional plagiarism detection systems to identify the original sources. Therefore, educational institutions need to develop robust policies and technological solutions to ensure academic integrity. This includes educating students about the ethical use of AI and implementing advanced plagiarism detection software capable of recognizing AI-generated content.

4.6 Impact on Learning Outcomes

The quantitative analysis indicates a positive correlation between the use of Generative AI tools and academic performance. Students who frequently used these tools showed an improvement in their GPAs, suggesting that AI can enhance learning outcomes by providing quick access to information and aiding in the generation of ideas. However, the qualitative data also highlighted a potential downside: overreliance on AI might hinder the development of critical thinking and problem-solving skills.

Critical analysis, for example, is crucial for evaluating the credibility of information and developing strong arguments. Without these skills, students may

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struggle to discern reliable sources from biased or inaccurate ones, which can compromise the quality of their academic work. Problem-solving skills are equally important, as they enable students to tackle complex issues independently, fostering innovation and resilience. If students rely too heavily on AI, they may miss out on opportunities to hone these essential skills, which are vital for both academic success and real-world applications.

Moreover, it is important to acknowledge that AI tools can also be used to develop critical thinking skills. For instance, students can learn to evaluate AI-generated outputs for accuracy and potential bias, fostering a more analytical and discerning approach to using technology in their studies. They can also triangulate AI-generated information with credible sources to ensure its reliability, thereby enhancing their critical evaluation skills.

5. CONCLUSION

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This study has explored the impact of Generative Artificial Intelligence on academic integrity and learning outcomes in three universities within Ghana's Upper East Region. The results indicate that while Generative AI tools offer significant benefits in terms of learning efficiency and academic performance, they also pose challenges to academic integrity. By implementing targeted policy recommendations, educational institutions can harness the advantages of AI while mitigating its risks. Future research should continue to monitor the long-term effects of AI on education, ensuring that both technological advancements and educational standards are upheld.

5.3 Recommendations

Based on the findings, several policy recommendations can be made to address the challenges and maximize the benefits of Generative AI in higher education:

1. **AI Literacy Programs:** Incorporate AI literacy into the curriculum within the next academic year to ensure that students and faculty understand how to use these tools ethically and effectively. These programs should cover topics such as understanding AI capabilities, limitations, potential biases, and ethical considerations.
2. **Ethical Guidelines:** Develop clear ethical guidelines for the use of Generative AI in academic work, including what constitutes acceptable use.
3. **Plagiarism Detection:** Invest in advanced plagiarism detection systems capable of identifying AI-generated content to uphold academic integrity.
4. **Balanced Usage:** Encourage a balanced approach to AI usage, promoting it as a tool to aid learning rather than replace traditional study methods.
5. **Continuous Monitoring:** Establish committees to continuously monitor the impact of AI on academic integrity and learning outcomes, adapting policies as necessary.

REFERENCES

Comment [F25]: Adding the DOI number of each reference could be better.

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DEFINITIONS, ACRONYMS, ABBREVIATIONS

AI ---------- Artificial Intelligence

BTU ---------- Bolgatanga Technical University

RUC ----------Regentropfen University College

CKT-UTAS -------- C. K Tedam University of Technology and Applied Sciences

GPA --------- Grade Point Average

Numpy---------- Numerical Python

Pandas ---------- Panel Data

ChatGPT ---------- Chat Generative Pre-trained Transformer

GenAI ---------- Generative Artificial Intelligence