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Artificial Intelligence (AI) in Academic Research in Ghana: Opportunities, Challenges, and Policy Implications

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Abstract

Background: The inclusion of Artificial intelligence (AI) into academia has a transformative potential for educational institutions, particularly in developing countries such as Ghana. But this progress also comes with its share of challenges, especially with infrastructure, ethical considerations and digital literacy. In this paper, we explore the views of academics at Ghanaian universities on AI usage in research activities.

Methods: A mixed methods design was used, with survey methodological triangulation with qualitative interviews. A sample of 300 people with backgrounds as educators, scholars, or students from diverse disciplines were asked to respond to the survey. Focus group In-depth interviews further yielded qualitative understandings on their attitudes and experience towards the integration of AI.

Results: The results reveal that 70% of respondents perceive writing quality to improve with AI, while 65% of respondents agree it reduced plagiarism. But 60% of respondents also cited infrastructural challenges and 55% ethical concerns when looking at AI adoption. The primary challenges were lack of internet access and training as well as long-term concerns about algorithmic bias. AI adoption was higher in STEM subjects (60% of science educators) than humanities (30%). Peer Pressure was rather evident as a significant construct influencing technology adoption decision consistent with behavioral theory postulated frameworks.

Conclusion: For Ghanaian academia to make the most of AI, specific investment in the digital infrastructure, and far-reaching AI literacy training efforts and ethical guidelines are required. The majority of studies reviewed in this paper vis-à-vis-meeting contributed to international conversations about fair use of AI, offering location-specific advice on creating educational settings.

Key words: Artificial intelligence; Ghana academia; digital divide; research technology; ethical frameworks

Introduction

Artificial intelligence (AI) has become a game changer at global level in academia providing unparalleled opportunity to improve research techniques, analyses of data, and educational approaches. There is a growing pace of AI adoption through academic research in Ghana; from personalized learning tools to advanced data analytics. For example, there is promising study of AI-based tutoring systems for improved maths learning outcomes for students [1].

The incorporation of AI in the academic environment in Ghana also comes with a range of challenges, including infrastructural bottlenecks, ethical implications, and requirement for expertise [2]. It has been noted that AI could potentially perpetuate bias found

in its training data, thereby creating ethical issues in produced research results [3]. Apart from that, the black box nature of AI algorithms (which makes it difficult to access how decisions are being made) is a major barrier to trust and acceptance among academics [4].

This research examines the opportunities and challenges related to AI integration in academic research in Ghana to reveal its present and prospective influence. Through insights from lecturers, researchers and students, the research reveals a comprehensive understanding of how AI is influencing academic work in Ghana and suggest some ways to address those challenges.

Methodology

Study Design

This research employed a mixed-methods approach, integrating both quantitative and qualitative research methods to assess the impact of AI tools on academic research in Ghana. This design facilitated the collection of numerical data on AI usage patterns and perceptions, as well as in-depth qualitative insights into personal experiences and ethical considerations.

Quantitative Component: A structured online survey was administered to gather data on:

- Frequency and types of AI tool usage in academic tasks.
- Perceived benefits of AI in enhancing research productivity and quality.
- Challenges and limitations encountered in using AI tools.
- Ethical concerns and awareness regarding AI applications in research.

Qualitative Component: Semi-structured interviews were conducted to explore:

- Personal experiences with AI tools in academic research.
- Insights into how AI has influenced research methodologies and outcomes.
- Perceptions of ethical issues, including bias, transparency, and accountability in AI applications.
- Suggestions for improving AI tool integration and addressing existing challenges.

Sample Size and Sampling Method

A total of 300 participants were selected using stratified random sampling to ensure representation across various academic roles and disciplines. The sample was divided as follows:

- **100 Educators**: Including professors, associate professors, and lecturers involved in research and teaching.
- **100 Researchers**: Comprising graduate students, post-doctoral researchers, and research fellows actively engaged in academic research.
- **100 Students**: Encompassing undergraduate and postgraduate students from diverse fields utilizing AI tools for academic purposes.

This stratification ensured that the sample reflected the diversity of AI tool usage and perspectives within Ghana's academic community.

Data Collection

- **Quantitative Data**: The online survey included questions on:
  - Frequency and types of AI tool usage in academic tasks.
  - Perceived benefits of AI in enhancing research productivity and quality.
  - Challenges and limitations encountered in using AI tools.
  - Ethical concerns and awareness regarding AI applications in research.
- **Qualitative Data**: Semi-structured interviews were conducted with 50 participants (10 from each group: educators, researchers, and students). The interviews aimed to explore:
  - Personal experiences with AI tools in academic research.
  - Insights into how AI has influenced research methodologies and outcomes.
  - Perceptions of ethical issues, including bias, transparency, and accountability in AI applications.
  - Suggestions for improving AI tool integration and addressing existing challenges.

Interviews were conducted via video conferencing platforms, recorded with consent, and transcribed verbatim for analysis.

Data Analysis

- **Quantitative Data**: Survey responses were analyzed using:
    - **Descriptive Statistics**: To summarize demographic information and usage patterns.
    - **Inferential Statistics**: Such as chi-square tests and ANOVA, to examine differences and relationships between variables (e.g., discipline, role, frequency of AI tool usage).
- **Qualitative Data**: Thematic analysis was employed to identify and interpret patterns and themes within the interview transcripts. This process included:
- **Familiarization**: Reading and re-reading transcripts to gain an understanding of the content.
- **Coding**: Assigning labels to segments of text that represent meaningful units related to the research questions.
- **Theme Development**: Grouping codes into broader themes that capture the essence of participants' experiences and perceptions.
- **Interpretation**: Relating themes to the research objectives and existing literature to draw conclusions and implications.

The NVivo software was utilized to facilitate coding and theme development, ensuring systematic and rigorous analysis.

Ethical Considerations

Ethical approval was obtained from the institutional review board (IRB) prior to data collection. Key ethical considerations included:

- **Informed Consent**: Participants were fully informed about the study's purpose, procedures, and their rights, including the right to withdraw at any time without consequence

Results and Analysis

Demographic Profile of Respondents

A total of 300 participants were surveyed, comprising 100 educators, 100 researchers, and 100 students.

Demographic Variable	Educators (n=100)	Researchers (n=100)	Students (n=100)	Total (n=300)
Gender				
Male	60	55	50	165
Female	40	45	50	135
Age Group				
20–29 years	0	30	70	100
30–39 years	20	40	20	80
40–49 years	50	20	10	80
50 years and above	30	10	0	40
Academic Discipline				
Science	60	50	30	140
Arts	20	30	40	90
Social Sciences	20	20	30	70
Role				
Educator	100	0	0	100
Researcher	0	100	0	100
Student	0	0	100	100

Table 1: ***Demographic Characteristics of Respondents***

Analysis:

- Males (55%) slightly outnumbered females (45%).
- Most educators were aged 40–49 years (50%), while students were primarily aged 20–29 years (70%).
- Science was the dominant discipline across roles (46.7% overall).

Attitudes Toward AI Tools

Participants' perceptions regarding AI tools in academic writing are summarized below.

Perception Statement	Agree (%)	Disagree (%)	Neutral (%)
AI tools improve writing quality	70	15	15
AI tools help in reducing plagiarism	65	20	15
AI tools enhance understanding of complex concepts	60	25	15
Overdependence on AI tools may hinder critical thinking	50	30	20
AI tools are essential for modern academic writing	45	35	20
Use of AI tools in academic work raises ethical concerns	55	25	20

Table 2: *Respondents' Perceptions of AI Tools*

Analysis:

- 70% believed AI tools enhance writing quality.
- 65% recognized AI's role in reducing plagiarism.
- Ethical concerns were acknowledged by 55% of respondents.

Extent of AI Tool Usage

Frequency of AI tool usage across different academic tasks is presented below.

Academic Task	Always (%)	Often (%)	Sometimes (%)	Rarely (%)	Never (%)
Idea generation	15	25	35	15	10
Spelling and grammar checks	35	30	20	10	5
Literature search	20	25	30	15	10
Concept clarification	15	20	25	20	20
Data analysis	10	15	25	25	25
Citation management	25	20	30	15	10

Table 3: *Frequency of AI Tool Usage*

Analysis:

- Spelling and grammar checks were the most frequent use cases (65% always or often).
- Idea generation and literature search were moderately common tasks.
- Data analysis had the lowest frequent use, with 50% using AI rarely or never.

Qualitative Results

Thematic Insights from Interviews

Semi-structured interviews (n=50) provided deeper understanding of participants' experiences with AI integration in academic research.

Emergent Themes:

Theme 1: Perceived Opportunities

AI tools were seen as valuable for enhancing writing, streamlining literature reviews, and improving research efficiency.

Academics valued AI's ability to simplify complex academic tasks, especially among novice researchers.

Theme 2: Infrastructure and Resource Barriers

- Interviewees cited unreliable internet connectivity and inadequate institutional infrastructure as major barriers.
- Participants from rural institutions emphasized technological limitations more than urban counterparts.

Theme 3: Ethical and Pedagogical Concerns

- Concerns regarding algorithmic bias, lack of transparency, and risks to academic integrity were frequently expressed.
- Some participants feared an over-reliance on AI might weaken students' critical thinking skills and creativity.

Theme 4: Influence of Social Norms

- Peer recommendations and encouragement from colleagues were major motivators for AI adoption.
- Participants linked their comfort level with AI use to the endorsement by trusted academic figures.

Theme 5: Disciplinary Differences

- STEM field respondents (particularly science and engineering) expressed greater enthusiasm for AI adoption.
- Humanities scholars were generally more cautious, citing ethical and philosophical concerns over humanistic aspects of education.

Discussion

Positive Perceptions and Utilization of AI Tools Findings Results Results summary: Perception of AI tools by Ghanaian academics on a five-point scale..responseText.replace("\\","")}") 21 Strong positive perception of AI tools among Ghanaian academics. Eight-in-ten also said that AI improves writing quality (70%) and helps in the effort to combat plagiarism (65%). These results were consistent with the literature reported which often describe the ability of AI to enhance students and researchers writing fluency, structure and originality [1,5].

This is supported by the qualitative findings, as the interview respondents emphasized the potential for AI to simplify academic work, indicating that the integration of AI improves overall efficiency in research. This corresponds to the wider trend internationally where adoption of AI is linked to better academic performance [6]

Infrastructural and Resource Challenges

Infrastructure was cited among the top barriers, with 60% of respondents to the survey saying that problems such as inconsistent internet access were preventing them from having access to AI tools. Interview findings also supported the perception that staff working in rural areas face more infrastructure problems.

The findings are in line with the [7], [8] in which digital infrastructure deficiencies are still a barrier for technology integration in African education systems, particularly in upcountry.

Ethical and Pedagogical Concerns

There were ethical considerations, such as algorithmic bias and data privacy, reaching 55% of the responses. Qualitative results provided further nuance into these concerns, expressing fears that critical thinking could suffer and that academic integrity could be in jeopardy.

[3] cautioned that biased algorithms can perpetuate systematic inequities in educational evaluations, and Crawford (2016) reminded about "black box" AI where decision-making isn't transparent. These results emphasize the need for ethical AI governance guidelines for academia.

Influence of Social Norms on AI Adoption

The influence of peer recommendations and colleague endorsements were important in the decision to adopt AI tools, particularly for early career researchers and students. This is consistent with the Theory of Planned Behavior [9] where subjective norms strongly determine behavioral intensions, especially related to technology adoption.

Corresponding influence was found in [10] for library AI services with the form of colleagues' social proof playing a central part in the uptake of technology.

Disciplinary Disparities in AI Acceptance

Quantitative results indicated that the adoption of AI was more prominent in the STEM sector (60%, in the science educator group) than in the humanities (30%). Interviewees supported this, with STEM faculty being more open to AI integration and framing it as an instrumental technology, and humanities faculty highlighting ethical concerns.

This disciplinary difference is consistent with the findings of [11] and [12] which concluded that technology adoption rates differ significantly across academic disciplines in a sample of African universities

Policy and Practice Implications

To ensure that AI change is good change, and to mitigate risks, strategic interventions are necessary:

Capacity Building: Holistic bible courses in AI [6].

Infrastructure Investment: Closing digital divides in urban and rural institutions [7].

Ethics: Imposing responsible AI governance across academia [3, 10]

So this study supports the worldwide demand for fair AI usage which does promote innovation and at the same time ensures ethical and equitable education.

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