



Utilization Level of Artificial Intelligence Tools in Research Writing among Undergraduate Biology Students in Zaria, Nigeria

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ABSTRACT

The study focused on the utilization level of artificial intelligence tools in research writing among undergraduate biology students in Zaria, Nigeria. The study was directed by one premise, two research questions, and two research aims. The study was carried out at the Federal University of Education, Zaria, which is situated in Kaduna State's Zaria Local Government Area. The study used a descriptive survey design. 225 biology students made up the study's sample, which was selected at random from the study population. A questionnaire called the "Utilization of Artificial Intelligence Tools for Research Writing Questionnaire (UAITRQ)" was used to gather data for this study. The mean and standard deviation of the data were utilized to assess the research questions, and the t-test was employed to test the null hypothesis. The results revealed that despite differences in academic level, students across all years are actively engaging with AI tools, recognizing their potential in enhancing research writing in Biology and there is a no statistically significant gender difference in the usage pattern of AI tools among undergraduate Biology students, with a p-value of 0.05. In light of the results, the researcher suggests that higher education institutions such as Federal University of Education, Zaria should develop and implement formal training programs or workshops on the responsible use of AI tools for academic purposes and Since the study indicated no substantial gender difference in the employment of AI tools, educational institutions should shift their attention from gender-based interventions to boosting digital competence for all students.

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INTRODUCTION

Artificial intelligence (AI) is becoming more embedded in the educational scenario. Globally, the rapid development in AI has become an important factor in changing educational approaches (Idris & Umar, 2024). Scholars and researchers delve into using AI technologies highlighting both the critical considerations and advancements that shape the future of education especially in Nigerian universities (Ibrahim *et al.*, 2024). Many people now believe that artificial intelligence (AI) is a key component of the fourth industrial revolution and could even spark the fourth educational revolution (Zhai *et al.*, 2021). In

the academic sphere, AI continues to play a vital role in research writing (Anih & Ukeh, 2024). Today, there are many AI tools that are employed in research writing, some of which include Rytr, Writesonic, CopyAI, QuillBot AI, ChatGPT, Paper Digest among others. Furthermore, by utilizing AI tools, researchers can successfully manage tasks such as creating titles, developing abstract, reviewing related literature, and cite and reference sources (Idris & Umar, 2024).

In the 21st century, digital revolution has greatly changed how knowledge is shared, applied and accessed, with growing emphasis on technological integration and student-centered

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learning AI tools have emerged as solution that support personalized instruction and support academic engagement (Abdulmumin & Abdulrahman, 2025). Artificial intelligence is a computer system that includes human-like processes like using data for complex processing tasks, learning, self-correcting, adapting, and synthesizing. Artificial intelligence is a device that is used all over the world. (Alimi *et al.*, 2021).

AI utilizes many techniques including language processing, machine learning, robotics, and computer vision to enable machines to reason, perceive and take actions based on the data they receive (Abdu, 2024). AI provides students with on-demand access to interactive platforms, learning resources and tools that foster effective knowledge acquisition (Abdulmumin & Abdulrahman, 2025). AI tools can be used to automate the extraction from PDF articles, share and organize research questions and predict citation impact, hence saving researcher's time, examples of such tools are Scopus, EndNote and Mendeley. Also, AI Grammarly can proofread and correct errors in research writing (Thomas, *et al.*, 2024).

In developing countries, utilization of AI tools is influenced by inadequate modern computing devices and lack of access to high-speed internet (Oribabor, 2024). In addition, Abdu (2024) reported that there are many issues affecting the utilization of AI tools such as ethical consideration, privacy concerns and bias in data training. Furthermore, there are growing concerns about ethical implications, risk of diminished human agency in education and over reliance on AI which could lead to reduced critical thinking, weakened academic integrity and increased plagiarism (Abdulmumin & Abdulrahman, 2025).

In Nigeria, the adoption and utilization of digital tools, including AI technologies, show significant variation across universities. Students attending private universities often benefit from better exposure to AI tools due to superior funding, proactive management policies, and smaller class sizes that facilitate more personalized learning experiences (Abdulmumin & Abdulrahman, 2025). Conversely, many Nigerian public colleges and universities have been slow to embrace AI

technologies despite their proven potential to enhance learning outcomes and better prepare students for the demands of the future workforce (Abdu, 2024). This uneven integration is often attributed to infrastructural challenges, limited technological expertise, and inconsistent policy implementation (Ojo & Eze, 2023).

Recognizing the strategic importance of AI, the Nigerian government established the National Agency for Research in Robotics and Artificial Intelligence (NARRAI) in 2018, aiming to promote stakeholder engagement, foster collaboration between academia, industry, and government, and accelerate AI-driven innovation across sectors (Thomas *et al.*, 2024). This initiative aligns with broader national digital transformation goals that prioritize capacity building and the integration of emerging technologies into education and research (Eze *et al.*, 2022). However, for effective nationwide adoption, sustained investment in digital infrastructure, faculty training, and inclusive policy frameworks remain critical (Adewale & Chukwuma, 2023). The disparities in AI adoption between private and public institutions underscore the need for targeted interventions to bridge the digital divide and ensure equitable access to AI-driven learning resources for all Nigerian students (Balogun & Adeoye, 2023).

Gender disparities significantly shape the dynamics of AI usage among students. Research consistently shows that female students often approach AI tools with more reflection, caution, and critical evaluation, whereas male students tend to exhibit higher confidence and a more exploratory attitude when navigating new technologies (Abdulmumin & Abdulrahman, 2025). These gendered experiences influence not only the adoption rates of AI tools but also the depth and manner in which these technologies are utilized in academic settings. For instance, studies reveal that female learners prioritize ethical concerns and accuracy when using AI, reflecting a more cautious engagement (Wang *et al.*, 2023). In contrast, male learners often focus on the efficiency and novelty aspects, displaying greater risk-taking and experimentation (Kumar & Gupta, 2022). This divergence extends to perceived self-

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efficacy, with males generally reporting stronger confidence in mastering AI-related tasks (Lee & Choi, 2024).

Moreover, gendered socialization patterns and stereotypes around technology competence contribute to these differing attitudes and behaviors (Smith & Anderson, 2021). Understanding these nuanced gender differences is crucial for designing effective AI integration strategies that foster equitable access, tailor user support, and enhance learning outcomes for all students (Nguyen et al., 2023). Despite the widespread utilization of AI, there is evidently lack of adequate research that explores students' utilization of AI in research writing, especially in Nigeria. Thus, this study aims to address this gap by exploring the utilization level of AI tools for research writing among undergraduate Biology students at Federal University of Education, Zaria.

STATEMENT OF THE PROBLEM

The utilization of Artificial Intelligence tools among undergraduate Biology students presents both opportunities and challenges that remain underexplored. Despite the fact that AI enhances learning through efficient research assistance, interactive simulation and personalized support, there is limited understanding of patterns of usage, perception of this technology and students' awareness in Biology Education. Moreover, concerns about gender disparities, ethical use and maintaining intellectual independence highlight the need for systematic investigation. This research aims to examine the extent of utilization of AI among undergraduate Biology students in Federal University of Education, Zaria, and access gender disparities in the usage of AI to improve educational outcomes while ensuring responsible and meaningful use.

OBJECTIVES OF THE STUDY

The following are the study's objectives:

1. To determine the extent undergraduate Biology students' utilization of AI tools in research writing.

2. To examine gender disparities in the use of AI among undergraduate Biology students

Research Questions

This study was guided by the following research questions:

1. To what extent do undergraduate Biology students' utilization of AI tools in research writing?
2. Are there any gender disparities in the usage pattern of AI tools among undergraduate Biology students?

Research Hypothesis

H₀₁: There is no significant gender difference in the usage pattern of AI tools among undergraduate Biology students.

METHODOLOGY

This study employed descriptive survey research design to systematically investigate utilization of AI tools in research writing among undergraduate Biology students. The study was conducted at Federal University of Education, Zaria, located at Zaria Local Government Area, Kaduna-State. It is focused on both male and female students writing research project. The population of the study consisted of all undergraduate Biology students from 200-400 level (541). Sample size was determined using Morgan and Krejcie (1970) table, 225 students were sampled for this work. The sampling technique employed was random sampling. The questionnaire was the instrument used in the collection of data. The questionnaire was titled Utilization of Artificial Intelligence Tools for Research Writing Questionnaire (UAI TRQ).

The questionnaire contained two sections. Section A required the demographic information of the respondents, Section B asked questions to determine the extent to which undergraduate Biology students utilize AI for research writing. The instrument was validated by two experts from Department of Biology, Federal University of Education, Zaria and the split-half method was used to assess reliability. The researchers administered the questionnaire to the

students during second semester, 2024/2025 academic session for a duration of 2 weeks. Data collected was analyzed using mean, standard deviation and t-test.

RESULTS

Table 1: Extent of Undergraduate Biology Students Utilization of AI Tools in Research Writing

S/N	STATEMENTS	SA	A	UN	D	SD	X	S.D
1	AI tools like ChatGPT or other AI chatbots are used for generating my research ideas.	73	123	11	11	3	4.14	0.83
2	Reference management AI tools such as Mendeley, Endnote etc is used for organizing citations in my work.	17	115	53	25	0	3.59	0.80
3	AI-powered grammar checkers like Grammarly was used to improve my writing.	34	120	17	26	23	3.53	1.19
4	AI tools like Elicit or Research Rabbit was used for literature search in my work.	25	94	45	34	23	3.29	1.17
5	AI tools was used for formatting and submitting my research papers.	40	88	37	42	14	3.44	1.17
6	I use AI tools for my research writing in Biology	43	103	20	32	23	3.50	1.25
7	AI tools help me organize and structure my research papers more effectively	45	133	23	0	14	3.91	0.95
8	Using AI tools improves the quality of my writing in Biology research	57	96	20	28	20	3.64	1.24
9	I find AI tools easy to use for tasks such as literature review, citation and data analysis	43	109	32	20	17	3.64	1.12
10	AI tools have increased my confidence in completing research writing	52	120	0	17	17	3.84	1.14
11	I am concerned about the accuracy and reliability of AI generated content on my research papers.	34	115	32	26	14	3.58	1.08
12	I have received adequate training and guidance on how to use AI tools for research writing.	27	109	21	44	21	3.35	1.20
13	I believe AI tools save time in research writing	64	99	23	0	23	3.87	1.18
14	I use AI tools to check for plagiarism in my research writing	23	115	29	23	0	3.73	0.83
15	I am open to using more advanced AI tools as they become available to improve my research writing skills	42	136	0	0	17	3.95	1.00
	Cumulative Mean						3.67	1.08

Benchmark: Mean ≥ 3.0 = High Level; Mean ≤ 3.0 = Low Level

The data in Table 1 reveals a high level of AI tool utilization among undergraduate Biology students (2nd, 3rd, and 4th year) in their research writing activities, as indicated by the cumulative mean of 3.67, which is well above the benchmark of 3.0. Students widely use AI tools like ChatGPT for generating research ideas (mean = 4.14) and Grammarly for grammar checks (mean = 3.53), suggesting that these tools have become integral in enhancing the quality and structure of their

work. A substantial number of students also utilize AI-powered reference managers like Mendeley (mean = 3.59) and tools like Elicit for literature search (mean = 3.29), though the latter shows relatively lower use compared to idea generation. The perception that AI tools improve the quality of writing (mean = 3.64), increase confidence (mean = 3.84), and save time (mean = 3.87) reflects a generally positive attitude across all academic levels.

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However, the relatively lower mean on receiving adequate training (mean = 3.35) and concerns about accuracy and reliability (mean = 3.58) suggest areas where institutions can intervene with structured guidance and digital literacy programs. Overall, the findings show that

despite differences in academic level, students across all years are actively engaging with AI tools, recognizing their potential in enhancing research writing in Biology.

Table 2: T-test Analysis of Gender Difference in the Usage Pattern of AI Tools among Undergraduate Biology Students

Gender	N	Mean	Std	df	T _{cal}	P value	Remark
Male	84	3.61	1.02	219	1.98	0.05	Not Significant
Female	137	3.72	1.10				

Significant at $P \leq 0.05$

The result of the t-test analysis in Table 2 indicates that there is no statistically significant gender difference in the usage pattern of AI tools among undergraduate Biology students. Although female students (Mean = 3.72, SD = 1.10) reported a slightly higher mean usage than their male counterparts (Mean = 3.61, SD = 1.02), the calculated t-value of 1.98 with a p-value of 0.05 falls on the threshold of the significance level. However, as denoted by the remark "N.S" (Not Significant), this suggests that the observed difference is not strong enough to be considered statistically meaningful. Therefore, gender does not significantly influence how undergraduate Biology students utilize AI tools for their academic work.

DISCUSSION

With a cumulative mean of 3.67, the results of Table 1 show that, among undergraduate biology students in second, third, and fourth years, AI technologies are somewhat often used in research writing. Students actively use AI products including Mendeley for reference management, Grammarly for grammar improvement, and ChatGPT for idea generation, according to the statistics. This is consistent with the results of Thomas et al (2024), who noted that undergraduate students thought AI tools like ChatGPT would help to improve learning outcomes and streamline academic activities. Driven by the simplicity of access and supposed academic advantages, Abdu Baba (2024) also

observed a rising trend in the acceptance and integration of AI tools in teaching and learning among university students in Jigawa State. But the rather low mean score for receiving sufficient training and worries about dependability point to a gap in formal education, echoing the results of Anih and Ukeh (2024), who revealed that many students lacked structured orientation or guidance on effectively using AI-assisted tools.

Furthermore, the high frequency of AI tool usage observed among undergraduate Biology students may also be influenced by increasing digital exposure and institutional support for technology-enhanced learning. Idris and Umar (2024) emphasized that consistent access to digital infrastructure and proactive institutional policies significantly contribute to students' ability to adopt AI tools in academic writing. Their study in universities in Katsina State found that when students are equipped with digital resources and supported with informal peer mentoring or workshops, the integration of AI tools becomes more seamless.

However, other scholars argue that high usage does not necessarily equate to meaningful or effective use. For example, Oribhabor (2024); Sani and Suleiman (2023) warned that while many students may frequently use AI tools, a substantial number do so without critical understanding of their functions or limitations, which can lead to misuse or over-reliance. Similarly, Okafor and Eze (2022); Zhai et al. (2021), in their review of AI in education from 2010 to 2020, noted that the lack of training on the ethical and evaluative aspects of

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AI tools could hinder students' long-term academic development. These contrasting perspectives suggest that while AI tools are widely used, there remains a pressing need for structured training to promote responsible, informed, and pedagogically sound application of AI technologies in research writing.

The finding that there is no statistically significant gender difference in the usage pattern of AI tools among undergraduate Biology students aligns with recent studies that suggest gender may no longer be a major determinant in the adoption of educational technologies. For instance, Abdulmumin and Abdulrahman (2025) found that both male and female undergraduates showed a relatively equal level of interest and engagement with AI tools like ChatGPT for academic purposes. Similarly, Yakubu and Haruna (2022); Alimi et al. (2021) reported that access to digital tools and exposure to AI applications were fairly balanced across genders, particularly in tertiary institutions where both male and female students have comparable access to internet-enabled devices and educational support systems. These findings support the idea that with growing digital literacy, gender-based differences in AI tool utilization are diminishing.

On the contrary, other researchers have found gender to be a significant factor in the adoption and use of AI technologies. Ibrahim et al. (2024); Chinwe and Musa (2023) noted that female students often demonstrated greater enthusiasm and a more positive attitude toward AI integration in educational assessments, which sometimes translated to higher usage rates. Similarly, Oribhabor (2024) highlighted that female students in certain disciplines tend to engage more deeply with AI tools for academic writing and learning, suggesting that motivation and perceived usefulness may still vary by gender. While the current study's result does not support a significant difference, it highlights the need for further investigation into the contextual and psychological factors—beyond gender—that influence AI tool utilization among students.

CONCLUSION

The findings of this study highlight a high level of utilization of AI tools for research writing among undergraduate Biology students across 2nd, 3rd, and 4th years. The students frequently use AI tools such as ChatGPT, Grammarly, Mendeley, and others for idea generation, grammar correction, reference management, and overall improvement of their academic writing. The high cumulative mean indicates that AI tools have become an integral part of students' research processes, enhancing their confidence, writing quality, and time efficiency. However, some areas of concern remain, particularly in the lack of adequate training and the perceived unreliability of AI-generated content, which could affect how effectively students engage with these technologies.

The gender-based analysis revealed no statistically significant difference in AI tool usage patterns between male and female undergraduate Biology students. Although female students reported slightly higher mean usage, the difference was not strong enough to suggest that gender plays a meaningful role in determining how students engage with AI technologies. This finding supports the view of scholars who argue that digital competence, accessibility, and institutional support are more critical determinants of AI tool adoption than gender alone. Overall, the findings indicate a growing reliance on AI tools among Biology undergraduates regardless of gender, while also highlighting the need for targeted training and guidance to ensure their responsible and effective use in academic contexts.

RECOMMENDATIONS

1. Higher education institutions such as Federal University of Education, Zaria should develop and implement formal training programs or workshops on the responsible use of AI tools for academic purposes.
2. Since the study indicated no substantial gender difference in the employment of AI tools, educational institutions should shift their attention from gender-based



interventions to boosting digital competence for all students.

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