



GENDER DIFFERENCES IN AI CHATBOT UTILIZATION AND RESEARCH KNOWLEDGE ACQUISITION AMONG FINAL-YEAR SCIENCE EDUCATION UNDERGRADUATES

¹Geoffrey Aondolumun Ayua, ²Patience Ijauka, ³Samuel Okanche, ⁴Idoma Jairus Obonga,
⁵Reuben Oibe Obu and ⁶Nguyiman Precious Iorpenda

^{1,2,3,4,5&6}Department of Science Education, Rev. Fr Moses Orshio Adasu University, Makurdi,
Nigeria (formaly Benue State University Makurdi).

Corresponding Author's Email: ayuageoffrey@gmail.com

Abstract

Gender differences in AI chatbot utilization and research knowledge acquisition among final-year science education undergraduates was survey-studied with two research questions and two hypotheses. Out of the 259 final-year science education undergraduates in Benue State University (now Rev. Fr. Moses Orshio Adasu University), Makurdi, Nigeria; a simple random sample of 102 was used for the study. A Likert-type data-collecting instrument “Artificial Intelligence Chatbot and Research Questionnaire (AICRQ)”, which was validated and trial tested on 25 students outside the study’s sample, with a Cronbach’s Alpha reliability coefficient of 0.78 was used to collect data for the study. Data were analysed using mean and standard deviation to answer the research questions; while the hypotheses were tested using Mann-Whitney U-test. Results showed a significant difference in the extent to which male and female final-year science education undergraduates utilize AI chatbots for research project writing [$U = 0.000$, $Z = -8.717$, $p = 0.000 < (\alpha = 0.05)$]; and a significant difference in the influence of AI chatbots usage on research knowledge acquisition among them [$U = 6.000$, $Z = -8.688$, $p = 0.000 < (\alpha = 0.05)$] favouring the males. The study concludes that gender significantly affected how AI chatbots usage contributed to research knowledge acquisition among final-year science education undergraduates. It was therefore, recommended that university administration should organize gender-responsive training, mentorship, and practical workshops with digital literacy support and access to AI tools, prioritizing female science education undergraduates to balance the gender difference in AI chatbot utilization and research knowledge acquisition.

Keywords: Science Education, AI Chatbots, Research Knowledge Acquisition, Research Project Writing, Gender.

Introduction

Science education is a vital component of any nation's development, serving as a foundation for technological development, innovation, and scientific literacy. Ayua (2018),

Ayua (2019), and Ayua and Taangahar (2024) stated that, in the 21st century, science education has become more critical than ever, given the rapid pace of scientific advancement, the growing complexity of global challenges such as

climate change, health pandemics, and food insecurity, and the increasing need for a scientifically informed citizenry. According to the Nigerian Educational Research and Development Council (NERDC, 2020), the aim of science education is to develop students' ability to observe, analyse, experiment, and draw conclusions through hands-on and minds-on activities. This shift ensures that undergraduates do not just reproduce existing knowledge but use analytical and experimental skills to address complex national challenges, through research.

Artificial Intelligence (AI) Chatbots are becoming increasingly prevalent in educational contexts, offering unique advantages that can significantly enhance the learning experience for science education final-year undergraduates. These intelligent tools are designed to provide instant support by answering questions, offering explanations, and suggesting resources relevant to research methodologies and writing skills (Ayua et al. 2026; Ayua & Akkabo, 2016; Nada et al., 2024). While AI chatbots offer substantial benefits, it is crucial to recognize the limitations inherent to this technology. Chatbots cannot replace the nuanced understanding and empathetic support that human interactions provide. Therefore, successful implementation requires a balanced approach, where chatbots supplement rather than substitute the mentorship provided by supervisors. By harmonizing the strengths of AI chatbots with traditional academic support, a more comprehensive educational experience can be cultivated, ultimately enhancing research knowledge and writing skills among science education final-year undergraduates (Brown & Halpern, 2021; Sanela et al., 2026; Tsakeni, & Nwafor, 2025).

Research knowledge acquisition refers to the structured process through which individuals identify, access, evaluate, and integrate information to generate meaningful understanding and new insights. Research knowledge acquisition is a critical component of academic success, particularly for science

education final-year undergraduates who are beginning to navigate the complexities of scientific inquiry. Ayua et al. (2022a), Ayua et al. (2022b), Igyu et al. (2023), and Reyna et al. (2025) observed that research foundational knowledge encompasses various elements, including understanding research methodologies, data collection techniques, and analytical frameworks. AI chatbots can play a pivotal role in enhancing this knowledge base by providing immediate access to informational resources and guidance tailored to students' specific queries. By engaging with chatbots, undergraduates can explore relevant concepts at their own pace, thus fostering a deeper understanding of the research process without the pressure of time constraints typically associated with traditional supervision (Kabariah, 2022). Ultimately, this continuous process contributes significantly to research project writing and knowledge acquisition in science education research.

Research writing in science education requires students to master academic conventions such as proper structure, technical language, objective tone, evidence-based arguments, and accurate citation practices. AI chatbots can support this process by modelling academic writing, improving sentence and paragraph coherence, correcting grammar, and generating organized outlines. They are particularly helpful for undergraduates transitioning from informal to academic writing and for non-native English speakers who need language support. The passage also highlights that AI chatbots can promote more inclusive and equitable participation in research across gender. However, some scholars argue that students should first develop foundational research and writing skills through traditional methods before relying on AI tools (Ayua et al., 2022a; Ayua et al., 2022b; Ayua, 2026; Stöhr, 2024). Although research on the long-term effects of AI chatbots use on learning outcomes is still limited, it is evident that their impact depends on teaching methods, institutional

policies, and the broader educational environment. Therefore, balanced and holistic approaches are needed to maximize the benefits of AI while addressing potential risks.

Gender refers to the socially and culturally constructed roles, behaviours, and expectations attributed to males and females. It differs from biological sex and influences learners' attitudes, self-efficacy, and participation in science education. Gender difference in science education and research denotes the observable variations between male and female students in the use of, access to, and benefits derived from science learning and research processes (Ayua et al., 2025; Ayua et al., 2026; Iddrisu et al., 2025; Møgelvang et al., 2024; Stöhr et al., 2024). It encompasses disparities in technology utilization, research competence, academic achievement, and opportunities for mentorship. In this study, it refers specifically to differences between male and female undergraduates in AI chatbot utilization and in the influence of AI chatbot usage on research knowledge acquisition. Gender is a crucial factor shaping how undergraduates engage with and benefit from artificial intelligence (AI) chatbots in science education research and research knowledge acquisition. Conversely, others maintain that foundational research knowledge and writing skills must be developed through traditional means before students can effectively utilize AI assistance, drawing parallels to the principle that students must master arithmetic before relying on calculators (Thong et al., 2025).

This study is anchored on Davis's (1989) Technology Acceptance Model (TAM) and Vygotsky's (1978) Social Constructivist Learning Theory. By examining how perceived ease of use and usefulness influence technology acceptance alongside the collaborative learning dynamics fostered by social interactions, these theories underscore the impact of AI chatbots on enhancing research knowledge and writing

skills among science education final-year undergraduates. Additionally, the Technology Acceptance Model (TAM), developed by Fred Davis in 1989, provides a theoretical framework for understanding how individuals come to accept and use new technologies. The model identifies two key constructs: perceived ease of use and perceived usefulness. Perceived ease of use refers to the degree to which a user believes that a particular technology does not require effort, while perceived usefulness denotes the extent to which a user believes that using the technology will enhance their performance. In the context of this study on gender differences in AI chatbot utilization and research knowledge acquisition among final-year science education undergraduates, TAM offers valuable insights into how science education undergraduates might evaluate the effectiveness and accessibility of AI chatbots in their academic pursuits.

Empirically a study conducted by Bello and Okonkwo (2023) investigated gender differences in critical thinking skills among secondary school students exposed to AI-based instruction in Chemistry in Abuja, Nigeria. Findings showed that female students slightly outperformed male students in critical thinking skills; however, the difference was not statistically significant. Milica et al. (2026) examined gender differences in AI-related knowledge, usage, and perceptions among university teachers in Serbia. The findings revealed no significant gender difference in self-reported AI knowledge. However, male lecturers reported more frequent use of ChatGPT and stronger perceptions of AI's productivity benefits, while female lecturers focused more on pedagogical and ethical considerations. Stöhr et al. (2024) explored students' perceptions and use of AI chatbots in higher education across gender, academic level, and field of study in Swedish universities. Findings showed widespread awareness and use

of ChatGPT among students, although concerns about AI use in education were also common. Significant differences emerged across gender and academic disciplines. Female students and students in humanities and medicine expressed greater concerns and more negative attitudes toward AI in learning and assessment, whereas male students and those in engineering and technology fields demonstrated higher usage and optimism toward AI tools. Maria et al. (2025) conducted a gender-inclusive investigation into AI literacy levels among undergraduate science education students at the University of the Free State, South Africa. The study found no significant gender difference in students' AI literacy levels. Møgelvang et al. (2024) investigated gender differences in the use of generative AI chatbots among higher education students in Norway. Findings indicated that male students used generative AI chatbots more frequently and for a wider range of purposes compared to female students. Male students also demonstrated greater interest in the career relevance and technical capabilities of AI chatbots. In contrast, female students primarily used AI tools for text-related tasks and expressed stronger concerns about the impact of AI on critical and independent thinking. Female students also showed a greater need for guidance on when and how to trust AI chatbots. Iddrisu et al. (2025) examined gender differences in the adoption, usage, and perceived effectiveness of AI writing tools among students at the University for Development Studies. The findings revealed that a majority of students (76.9%) used AI writing tools, with 31.6% reporting daily usage. Although male and female students differed slightly in usage patterns, no significant gender difference was found in perceived effectiveness, as both groups considered AI tools beneficial for academic writing.

All these reviewed studies were useful and relevant to this study based on AI chatbots, and gender. However, this study was different because the reviewed studies were carried out in

different geographical locations, different populations, samples and samplings including different research designs. Therefore, this study investigated gender differences in AI chatbot utilization and research knowledge acquisition among final-year science education undergraduates in Benue State University (now Rev. Fr. Moses Orshio Adasu University), Makurdi, Nigeria.

Statement of the Problem

Despite the growing adoption of AI chatbots in educational settings, there are concerns regarding how effectively students utilize these technologies for academic and research purposes. Many science education undergraduates still experience difficulties in research activities such as identifying research problems, reviewing literature, analysing data, interpreting findings, and writing scientific reports (Ayua et al., 2022a; Ayua et al., 2022b; & Reyna et al., 2025). Poor research knowledge acquisition among undergraduates has continued to affect the quality of students' academic projects and scientific investigations in many universities. Therefore, the problem of this study is the lack of sufficient empirical evidence on the extent to which gender influences the use of artificial intelligence chatbots and how such influences science education final-year undergraduates' acquisition of research knowledge. Therefore. It is against this backdrop that gender differences in AI chatbot utilization and research knowledge acquisition among final-year science education undergraduates was survey-studied with the objectives to:

1. Determine the extent to which AI chatbots are utilized by final-year science education undergraduates for research project writing based on gender.
2. Establish the influence of AI chatbots usage on research knowledge acquisition of final-year science education undergraduates based on gender.

Research Questions

1. To what extent are AI chatbots utilized by final-year science education undergraduates for research project writing based on gender?
2. What is the influence of AI chatbots usage on research knowledge acquisition among final-year science education undergraduates based on gender?

Hypotheses

1. The extent to which AI chatbots are utilized by final-year science education undergraduates for research project writing is not significantly different based on gender.
2. The influence of AI chatbots usage on research knowledge acquisition of science education final-year undergraduates is not significantly different based on gender.

Methodology

The research design adopted for this study was the descriptive survey design. Descriptive survey design is a form of research design which seeks to describe events, conditions and occurrences as they are without any manipulations of what causes the events being described (Creswell, 2012). This method is deemed appropriate for the study because it surveyed the perceptions regarding the existing realities on gender differences in AI chatbot utilization for research project writing and research knowledge acquisition among final-year science education undergraduates, without manipulating any variables. The population of the study comprised 259 final-year science

education undergraduates in Benue State University (now Rev. Fr. Moses Orshio Adasu University), Makurdi, Nigeria. From the population, a simple random sample of 102 was drawn and used for the study. Artificial Intelligence Chatbot and Research Questionnaire (AICRQ) was used to collect data for the study. The Likert-type data-collecting instrument had three sections. Section A, generated respondents' biodata. Section B, had 15 items, which elicited data on the extent of AI chatbots utilization for research project writing. Section C, had 20 items and drew data on the influence of AI chatbots usage on research knowledge acquisition among final-year science education undergraduates. AICRQ is a 5-point response scale with Very High Extent (VHE) = 4 (3.50-4.00), High Extent (HE) = 3 (2.50-3.49), Moderate Extent (ME) = 2 (1.50-2.49), Low Extent (LE) = 1 (0.50-1.49), and Nil (N) = 0 (0.00-0.49). This was validated by two experts in science, and Mathematics education in the university. AICRQ was trial tested on 25 students outside the study's actual sample, with a Cronbach's Alpha reliability index of 0.78. Data were analysed using mean and standard deviation to answer the research questions; while the hypotheses were tested using Mann-Whitney U-test at 0.05 alpha level of significance.

Results

The results of the data analysis for the study are presented in order of the research questions and hypotheses as follows:

Research Questions One: To what extent are AI chatbots utilized by final-year science education undergraduates for research project writing based on gender?

Table 1: Mean and Standard Deviation of AI Chatbots Utilized by Final-Year Science Education Undergraduates for Research Project Writing Based on Gender.

S/N	Item	Male, n = 50			Female, n = 52		
		Mean	St. Dev.	Extent	Mean	St. Dev.	Extent
1	Meta AI	3.86	.351	VHE	2.33	.923	ME
2	ChatGPT	4.00	.000	VHE	3.23	.645	HE
3	Google Gemini	3.52	.505	VHE	1.58	.723	ME
4	Grammarly AI	3.36	.485	HE	1.58	.667	ME
5	Elicit	2.18	.825	ME	0.19	.398	N
6	Scite	2.84	1.570	HE	0.04	.194	N
7	Consensus AI	2.40	.904	ME	0.00	.000	N
8	Quilbot	2.18	.941	ME	0.02	.139	N
9	Zotero	1.78	1.016	ME	0.00	.000	N
10	Mendeley	1.96	1.049	ME	0.00	.000	N
11	Research rabbit	1.98	.869	ME	0.17	.382	N
12	Iris.AI	2.12	.872	ME	0.03	.139	N
13	Perplexity AI	2.34	1.136	ME	0.00	.000	N
14	Scholarcy	2.16	1.017	ME	0.00	.000	N
15	Poe AI	2.08	1.007	ME	0.00	.000	N
	Cluster	2.58	0.836	HE	0.61	0.281	LE

Key: 3.50-4.00 = VHE, 2.50-3.49 = HE, 1.50-2.49 = ME, 0.50-1.49 = LE, 0.00-0.49 = N

The result in Table 1 shows the mean and standard deviation of responses on the extent of AI chatbots usage among male and female final-year science education undergraduates for research project writing. The findings revealed a notable gender disparity in AI chatbots usage. Male undergraduates recorded a cluster mean of 2.58 (SD = 0.836), indicating a high extent of AI chatbots usage. This suggests that male undergraduates vastly utilized AI chatbots in research writing activities. ChatGPT, Meta AI, and Google Gemini, emerged as the most used (VHE) chatbots among the males; followed by Google Gemini and Grammarly AI (HE); while the rest AI chatbots were utilized at moderate extent (ME) by male undergraduates. In contrast, female undergraduates recorded a cluster mean of 0.61 (SD = 0.281), indicating a low extent of AI chatbots usage overall. Although female

respondents showed relatively high extent usage of ChatGPT and moderate extent usage of Meta AI, Google Gemini, and Grammarly AI, the rest of the AI chatbots were not utilized by the females. The findings further showed that male undergraduates had more consistent usage patterns across different AI tools, while female undergraduates displayed limited engagement concentrated on a few commonly known platforms. Overall, the result indicates a significant gender gap in AI chatbots adoption for research project writing, with male students demonstrating substantially higher usage than female students.

Research Question Two: What is the influence of AI chatbots usage on research knowledge acquisition among final-year science education undergraduates based on gender?



Table 2: Mean and Standard Deviation of AI Chatbots Usage Influence on Research Knowledge Acquisition among Science Education Undergraduates by Gender.

Item: To what extent do AI chatbots usage for research project writing enhanced your research knowledge acquisition in items 1 - 20?	Male, n = 50			Female, n = 52		
	Mean	St. Dev.	Extent	Mean	St. Dev.	Extent
(1). Knowledge of stating research problems	4.00	.000	VHE	2.85	.500	HE
(2). Knowledge of research methodology	3.92	.274	VHE	2.67	.617	HE
(3). Ability to critically analyse research materials	3.84	.370	VHE	2.65	.520	HE
(4). Independent learning during the research process	3.62	.490	VHE	2.62	.530	HE
(5). Knowledge in interpretation of research results.	3.32	.471	HE	1.83	.678	ME
(6). Skills for searching relevant academic literature	3.46	.503	HE	2.44	.574	ME
(7). Understanding of complex research topics	3.48	.505	HE	2.37	.627	ME
(8). Understanding of data analysis techniques	3.38	.490	HE	2.21	.536	ME
(9). Acquisition of research ideas	3.48	.505	HE	2.15	.638	ME
(10). Understanding of research terminologies	3.40	.495	HE	2.29	.605	ME
(11). Skilful knowledge in reviewing empirical studies	3.48	.505	HE	2.10	.569	ME
(12). Ability to summarise research articles effectively	3.40	.495	HE	2.10	.664	ME
(13). Knowledgeable confidence in conducting research activities	3.38	.490	HE	2.27	.528	ME
(14). Understanding of statistical concepts used in research	3.30	.463	HE	2.12	.646	ME
(15). Ability to discuss research findings	3.34	.479	HE	2.25	.622	ME
(16). Acquisition of knowledge in sampling techniques	3.38	.490	HE	2.21	.536	ME
(17). Knowledge of organising research reports	3.48	.505	HE	2.15	.638	ME
(18). Active engagement with research materials	3.40	.495	HE	2.29	.605	ME
(19). Identification of research gaps in academic literature	3.48	.505	HE	2.10	.569	ME
(20). Learning faster during your research project work	3.40	.495	HE	2.10	.664	ME
Cluster	3.47	0.45	HE	2.30	0.58	ME

Key: 3.50-4.00 = VHE, 2.50-3.49 = HE, 1.50-2.49 = ME, 0.50-1.49 = LE, 0.00-0.49 = N

The data in Table 2 show that AI chatbots usage has a differential influence on research knowledge acquisition between male and female final-year science education undergraduates. For the males, the cluster mean score is 3.47 with SD = 0.45, which falls within the High Extent range. Four items were rated at Very High Extent: knowledge of stating research problems, knowledge of research methodology, ability to critically analyse research materials, and independent learning during the research process. The remaining 16 items were rated at High Extent, with means ranging from 3.30 to 3.48. This indicates that male undergraduates perceive AI chatbots as strongly enhancing core research competencies including problem formulation, methodology, critical analysis, literature search, data analysis, report organization, and understanding of statistical concepts. Concerning the females, the cluster mean score is 2.30 with SD = 0.58, which falls within the Moderate Extent range. No item reached Very High Extent. Four items were rated at High Extent: knowledge of stating research problems, knowledge of research methodology, ability to critically analyse research materials, and independent learning. The remaining 16 items were rated at Moderate Extent, with means ranging from 1.83 to 2.44. This suggests that while females acknowledge some benefit of AI chatbots, particularly in basic research skills, the influence is less pronounced

for technical and analytical aspects such as interpretation of results, identification of research gaps, and acquisition of research ideas.

In comparison, there is a clear gap of 1.17 between the male cluster mean of 3.47 and the female cluster mean of 2.30. Males consistently rated the influence of AI chatbots higher across all 20 items. The lower standard deviation for males (0.45 vs 0.58) also indicates more consensus among male respondents regarding the positive influence of AI chatbots. This implies that AI chatbots usage contributes more substantially to research knowledge acquisition for male than for female final-year science education undergraduates. The higher ratings by males suggest greater engagement, confidence, or proficiency in using AI tools to support research tasks. For females, the moderate influence indicates that while AI chatbots are useful, barriers such as lower digital self-efficacy, limited access, or less training may be limiting the extent to which they benefit from these tools in research. Therefore, based on this result, gender plays a role in the extent to which AI chatbots enhance research knowledge acquisition, with males experiencing a higher level of influence than females.

Hypothesis One: The extent to which the AI chatbots are utilized by science education undergraduates for research project writing is not significantly different based on gender.

Table 3: U-Test Result on Extent of AI Chatbots Utilization in Research Project Writing by Undergraduates Based on Gender

Gender	N	Mean Rank	Sum of Ranks	U	Z	P	α	Decision	Remark
Male	50	77.50	3875.00	0.000	-8.717	0.000	0.05	Rejected	Significant
Female	52	26.50	1378.00						

Table 3 presents the Mann-Whitney U-test analysis result of the extent to which AI chatbots are utilized by science education

undergraduates for research project writing based on gender. The result showed that male students had a higher mean rank of 77.50 with a

sum of ranks of 3875.00, while female students had a lower mean rank of 26.50 with a sum of ranks of 1378.00. The Mann-Whitney U-test yielded 0.000 at a p-value of 0.000 with a Z-value of -8.717. Since the p-value (0.000) is less than the 0.05 alpha level of significance, the null hypothesis which stated that “the extent to which the AI chatbots are utilized by final-year science education undergraduates for research project writing is not significantly different based on gender” was rejected. Thus, the extent to which

male and female final-year science education undergraduates utilize AI chatbots for research project writing is significantly different in favour of the males with a mean rank significantly higher than the females.

Hypothesis Two: The influence of AI chatbots usage on research knowledge acquisition of science education undergraduates is not significantly different based on gender.

Table 4: U-Test Result of AI Chatbots Usage Influence on Undergraduates’ Research Knowledge Acquisition Based on Gender

Gender	N	Mean Rank	Sum of Ranks	U	Z	P	α	Decision	Remark
Male	50	77.38	3869.00	6.000	-8.688	0.000	0.05	Rejected	Significant
Female	52	26.62	1384.00						
Total	102								

Results in Table 4 presents the Mann-Whitney U-test analysis of the influence of AI chatbots usage on research knowledge acquisition of final-year science education undergraduates based on gender. The result revealed that male students had a higher mean rank of 77.38 with a sum of ranks of 3869.00, while female students had a lower mean rank of 26.62 with a sum of ranks of 1384.00. The Mann-Whitney U-test value obtained was 6.000 with a p-value of 0.000 and a Z-value of -8.688. Since the p-value (0.000) is less than the 0.05 alpha level of significance, the null hypothesis which stated that “the influence of AI chatbots usage on research knowledge acquisition of final-year science education undergraduates is not significantly different based on gender” was rejected. This implies that the influence of AI chatbots usage on research knowledge acquisition among final-year science education undergraduates based on gender is significantly different in favour of the males with a mean rank significantly higher than their female mates.

Discussion of Findings

Gender differences in AI chatbot utilization and research knowledge acquisition among final-year science education undergraduates was survey-studied and two findings emerged as discussed underneath.

With regards to gender difference in the extent of AI chatbot utilization for research project writing, the study established a significant difference in the extent to which male and female final-year science education undergraduates utilize AI chatbots for research project writing, $U = 0.000$, $Z = -8.717$, $p = 0.000 < 0.05$. Male undergraduates recorded a cluster mean of 2.58, interpreted as High Extent, while females recorded a cluster mean of 0.61, interpreted as Low Extent. Specifically, males reported Very High Extent use of ChatGPT, Meta AI, and Google Gemini, and High Extent use of Grammarly AI and Scite, whereas females showed usage mainly on ChatGPT and Meta AI at High and Moderate Extent respectively, with near-zero use of other research-specific tools such as Elicit, Consensus, Zotero and Mendeley. This finding

indicates that male undergraduates are adopting a broader range of AI chatbots and integrating them more consistently into research writing activities. The result aligns with Møgelvang et al. (2024) and Stöhr et al. (2024) who reported higher frequency of AI chatbot use among male students and greater optimism toward AI tools in technology-related fields. In contrast, it contradicts Iddrisu et al. (2025) and Maria et al. (2025) who found no significant gender difference in AI tool usage and literacy. From the lens of Davis's (1989) Technology Acceptance Model, the disparity may reflect differences in perceived ease of use and perceived usefulness of AI chatbots between males and females. The implication is that without targeted intervention, the gender gap in AI chatbot adoption could widen existing inequalities in research productivity and digital competence among science education undergraduates.

In relation to gender difference in the influence of AI chatbot usage on research knowledge acquisition, the findings revealed a significant difference in the influence of AI chatbots usage on research knowledge acquisition between male and female undergraduates, $U = 6.000$, $Z = -8.688$, $p = 0.000 < 0.05$, favouring males. Male respondents had a cluster mean of 3.47, rated as High Extent, with Very High Extent ratings for knowledge of stating research problems, research methodology, critical analysis, and independent learning. Female respondents had a cluster mean of 2.30, rated as Moderate Extent, with only four items at High Extent and the remaining 16 items at Moderate Extent. This suggests that AI chatbots contribute more substantially to males' development of core research competencies such as data analysis, interpretation of results, identification of research gaps, and organization of research reports. The finding is consistent with Møgelvang et al. (2024) who reported that males use generative AI for a wider range of purposes and show greater interest in its technical and career relevance. However, it

differs from Bello and Okonkwo (2023) and Iddrisu et al. (2025) who found no significant gender difference in perceived effectiveness of AI tools. Grounded in Vygotsky's (1978) Social Constructivist Learning Theory, this disparity may indicate that males are engaging more collaboratively and independently with AI chatbots as cognitive tools, leading to deeper internalization of research knowledge. The practical implication is that AI chatbots, while promising for enhancing research knowledge, are currently benefiting male undergraduates more. This underscores the need for gender-responsive training, mentorship, and digital literacy support, particularly for female students, to ensure equitable acquisition of research skills through AI technologies.

Conclusion and Recommendations

The study concludes that gender significantly influences both the utilization of AI chatbots and their perceived influence on research knowledge acquisition among final-year science education undergraduates. Male undergraduates demonstrate greater adoption and benefit more from AI chatbots in developing research skills. The disparity indicates that the potential of AI chatbots to enhance research competence is not being equitably realized across genders. Without targeted intervention, this gap may exacerbate existing inequalities in digital literacy and research productivity. Thus, it was recommended that:

- i. Institutions should organize workshops and training programs to improve students' knowledge and effective use of AI chatbots.
- ii. Efforts should be made to bridge the gender gap by encouraging equal access and exposure to AI tools for all students.
- iii. Universities should establish clear policies and guidelines on the ethical use of AI in academic research.

Implementation of these measures will promote equitable AI adoption and enhance



research knowledge acquisition among all science education undergraduates.

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