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An analysis of ChatGPT generative content usage towards students' academic work based on gender perspective

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Abstract

The rapid adoption of generative artificial intelligence (AI), particularly ChatGPT, has transformed students' academic practices, raising important questions regarding usage patterns, academic integrity, and learning behavior. This study aims to examine gender-based differences in the frequency of ChatGPT usage among university students and to identify which academic tasks show the most significant variation between male and female students. A quantitative survey design was employed, involving 20 English education students from Institut Parahikma Indonesia and UIN Alauddin Makassar, consisting of 10 male and 10 female participants. Data were collected through a structured Likert-scale questionnaire and analyzed using descriptive statistics and comparative analysis to identify usage trends and behavioral patterns. The findings reveal that female students consistently demonstrate higher usage of ChatGPT across a wider range of academic functions, particularly in grammar improvement, understanding assignment instructions, and refining academic writing. In contrast, male students tend to use ChatGPT more selectively, mainly for comparing outputs and evaluating argument clarity. Both groups show low dependence on ChatGPT for full task automation, indicating maintained academic autonomy. The most significant gender-based difference is found in language enhancement tasks, where female students exhibit substantially higher engagement. These findings suggest that educators should consider gender-based preferences when integrating AI into learning environments and promote balanced, ethical, and critical use of generative AI to support effective and responsible academic practices.

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INTRODUCTION

In recent years, the rapid development of generative artificial intelligence (AI), particularly ChatGPT developed by OpenAI, has significantly transformed how students approach academic work. These AI-driven tools are capable of producing coherent, contextually relevant, and linguistically accurate texts, thereby offering new possibilities for supporting writing, idea generation, summarization, and language refinement (Su & Yang, 2023; Rahman & Watanobe, 2023). In addition, recent studies suggest that AI-powered chatbots can function not only as writing assistants but also as interactive learning partners that facilitate adaptive learning and immediate feedback, enabling students to actively construct knowledge (Tlili et al., 2023). As a result, ChatGPT has quickly become embedded in students' daily academic practices, reshaping traditional learning processes and raising new pedagogical considerations (Dwivedi et al., 2023; Kasneci et al., 2023). The increasing reliance on generative AI in education has triggered extensive discussions on its implications for learning quality, academic integrity, and student autonomy.

At the global level, the adoption of ChatGPT among students has reached a substantial scale. More than 70% of students worldwide have reportedly used ChatGPT at least once for academic purposes, including 74% in developed countries and 71% in developing countries (Amoah et al., 2025). Similarly, approximately 70% of secondary school students aged 13–16 have utilized ChatGPT, and the percentage rises to 90–95% among university students (Sublime & Renna, 2024). In higher education, surveys indicate that up to 97% of university students have engaged with AI

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tools to support academic tasks such as writing, problem-solving, and research (Olander, 2025). These statistics demonstrate that generative AI is no longer a supplementary tool but has become an integral component of contemporary academic practices.

In the Indonesian context, the integration of ChatGPT into higher education is increasingly evident, although empirical quantitative data remain relatively limited. Existing studies tend to emphasize perceptions and qualitative insights rather than measurable usage patterns (Panggabean & Silalahi, 2025). Nevertheless, several studies have shown that Indonesian students actively use ChatGPT for various academic purposes, including drafting essays, translating texts, paraphrasing sources, and answering complex comprehension questions (Juanda & Afandi, 2024; Arifin et al., 2025; Helmiatin et al., 2024). Furthermore, ChatGPT has been identified as a supportive learning assistant that reduces students' anxiety in writing tasks and enhances second language performance, particularly in English as a Foreign Language (EFL) settings (Arifin et al., 2025). However, its effective use still requires guidance from educators, especially in developing appropriate prompts and critically interpreting AI-generated outputs (Ishida et al., 2024).

Despite these benefits, the widespread use of ChatGPT raises significant concerns regarding academic integrity, critical thinking, and students' dependence on AI. While generative AI can improve linguistic accuracy and writing coherence, excessive reliance may reduce students' originality, analytical skills, and engagement with academic sources (AlAfnan et al., 2023; Ateeq et al., 2024). The issue of authorship and ethical responsibility has become increasingly prominent, as students may struggle to balance AI assistance with independent intellectual effort (Cotton et al., 2024; UNESCO, 2024). Additionally, emotional responses such as guilt, discomfort, and ethical conflict have been observed among students who rely heavily on AI tools, indicating that the use of ChatGPT is not only a technical matter but also a psychological and ethical issue (Qu & Wang, 2025). These concerns highlight the need for a more nuanced understanding of how students interact with AI in academic contexts.

Another important dimension in understanding ChatGPT usage is gender. Gender, as a social construct, influences individuals' attitudes toward technology, learning behaviors, and ethical decision-making. Previous studies have shown that male and female students exhibit different patterns in adopting and utilizing digital technologies. Male students tend to use AI tools for analytical and problem-solving purposes, such as evaluating information and validating arguments, whereas female students are more inclined to use them for language-related tasks and reflective academic work (Fadillah & Akbar, 2025; Azoulay et al., 2025). These findings are consistent with earlier research suggesting that males often demonstrate higher confidence in adopting new technologies, while females exhibit more cautious and ethically oriented approaches (Gefen & Straub, 1997). In the context of generative AI, these differences may influence not only how frequently students use ChatGPT but also the purposes and strategies underlying its use.

Moreover, the issue of gender bias embedded in AI systems further complicates the discussion. Reports by UNESCO (2024) indicate that generative AI models may reproduce and reinforce stereotypical representations, associating women with domestic roles and men with leadership positions. Such biases may indirectly shape users' perceptions and interactions with AI technologies. Consequently, examining ChatGPT usage from a gender perspective is essential for understanding how technological, social, and ethical factors intersect in shaping students' academic behaviors. This perspective also aligns with broader discussions on equity and inclusivity in digital education.

Although previous studies have provided valuable insights into ChatGPT usage in education, several important gaps remain. First, much of the existing literature focuses on students' perceptions, attitudes, or general usage patterns without offering detailed quantitative comparisons of usage across gender groups (Stöhr et al., 2024; Panggabean & Silalahi, 2025). Second, prior research has rarely examined how male and female students differ in utilizing ChatGPT for specific academic tasks, such as idea generation, grammar improvement, paraphrasing, and argument validation. Most studies tend to generalize usage behavior, thereby overlooking nuanced differences that may exist at the task level (Ruiz-Rojas et al., 2024; Zhai, 2022).

Furthermore, research in the Indonesian higher education context remains limited, particularly studies employing comparative quantitative approaches to analyze gender-based differences in AI usage. While some studies have explored students' experiences and perceptions,

there is still a lack of empirical evidence that systematically measures and compares usage frequency and patterns between male and female students (Helmiatin et al., 2024; Arifin et al., 2025). In addition, existing studies have not sufficiently addressed how ethical concerns, academic integrity issues, and behavioral tendencies intersect with gender in shaping students' engagement with generative AI. This indicates a clear need for research that integrates technological, educational, and social perspectives to provide a more comprehensive understanding of ChatGPT usage in academic settings.

Based on these considerations, this study aims to examine: (1) whether there are differences in the frequency of ChatGPT usage between male and female students across various academic tasks, and (2) which aspects of academic work demonstrate the most significant gender-based differences in ChatGPT usage.

This study contributes to the existing literature in several ways. First, it provides empirical quantitative evidence on gender-based differences in ChatGPT usage within the Indonesian higher education context, addressing the current lack of data-driven studies. Second, it offers a more detailed analysis of specific academic tasks in which ChatGPT is utilized, thereby extending previous research that primarily focuses on general usage patterns. Third, this study integrates perspectives on academic integrity, ethical AI use, and student behavior, contributing to a more holistic understanding of AI integration in education. Finally, the findings are expected to inform educators and policymakers in designing more equitable, responsible, and contextually relevant strategies for integrating generative AI into teaching and learning processes.

METHOD

This study employed a quantitative descriptive approach with a comparative design to examine patterns of ChatGPT usage among university students, particularly focusing on gender-based differences. The quantitative approach was selected because it enables the collection of measurable data, identification of usage trends, and statistical comparison between groups (Creswell, 2017). In addition, a comparative framework was adopted to systematically explore differences in frequency and behavior between male and female students in utilizing ChatGPT for various academic tasks, allowing for clearer interpretation of group-based variations.

The population of this study consisted of undergraduate students enrolled in similar academic programs, specifically English education students from two different universities, UIN Alauddin Makassar (UINAM) and Institut Parahikma Indonesia (IPI). The sample was selected using purposive sampling to ensure representation of participants who actively engage in academic writing and are familiar with the use of ChatGPT. The study involved one English class from each institution, with 35 students from UINAM and 7 students from IPI, resulting in a total of 42 participants comprising 10 male and 32 female students. Due to the imbalance in gender distribution, a random subsample of 10 female students was selected to match the number of male participants. This procedure was conducted to ensure comparability between groups and to minimize bias in the analysis of gender-based differences.

The instrument used in this study was a structured questionnaire consisting of Likert-scale items designed to measure the frequency of ChatGPT usage and the level of student dependence on the tool. The questionnaire included items addressing various academic functions, such as understanding assignment instructions, generating ideas, improving grammar, paraphrasing, and evaluating arguments. In addition, several items were specifically developed to assess the extent of reliance on ChatGPT, including the use of AI as a primary tool for completing assignments, dependence on AI instead of consulting original academic sources, and students' perceived confidence in completing tasks without AI assistance. The use of structured questionnaires allowed for standardized data collection and facilitated quantitative analysis across participants.

Data analysis was conducted using SPSS (Statistical Package for the Social Sciences). Descriptive statistical techniques, including mean, standard deviation, and frequency distribution, were employed to summarize students' responses and identify patterns of ChatGPT usage across different academic tasks. These statistical measures provided an overview of central tendencies and variability within each gender group, enabling comparisons between male and female students. Ethical considerations were carefully addressed throughout the research process. Participants were

informed about the purpose of the study, and their participation was voluntary. Confidentiality and anonymity were ensured by not disclosing any personal identifying information, thereby maintaining ethical standards in data collection and analysis.

RESULTS AND DISCUSSION

Results

This section presents the primary findings of the study regarding the patterns of ChatGPT usage among university students, with a particular focus on gender-based differences in academic contexts. The results are organized to highlight key aspects of students' interactions with generative AI, including the frequency of use across various academic tasks, levels of dependence on ChatGPT, and comparative tendencies between male and female students. Each part of this section systematically outlines the descriptive statistical outcomes derived from questionnaire responses, followed by a comparative interpretation of usage patterns. Collectively, these findings reveal that while both groups utilize ChatGPT as a supportive learning tool, notable differences exist in how male and female students integrate AI into their academic practices, particularly in language-related tasks, idea generation, and critical evaluation processes. These patterns provide important insights into the role of generative AI in shaping students' academic behavior and learning strategies in higher education.

Frequency Difference Between Male and Female Students in Using ChatGPT for Various Academic Tasks

To provide a comprehensive overview of students' interaction with ChatGPT in academic settings, this section begins by presenting the overall frequency distribution of responses across all questionnaire items. The analysis focuses on how often students engage with ChatGPT for different academic purposes, ranging from basic support tasks such as understanding instructions to more complex activities such as generating full drafts. The following table summarizes the distribution of responses from all participants based on a five-point Likert scale.

Table 1. Students' Response based on both Gender

ASPECT	NO	STATEMENTS	NEVER	RARELY	SOMETIMES	OFTEN	ALWAYS
CHATGPT USAGE BASED ON GENDER	1	I use ChatGPT to understand assignment instructions from the lecturer.	1	2	8	6	3
	2	I use ChatGPT to search for ideas before starting to write an assignment.	0	2	4	10	4
	3	I use ChatGPT to create an outline for my assignment.	1	5	6	7	1
	4	I ask ChatGPT to generate the entire draft of my assignment.	5	8	6	1	0
	5	I use ChatGPT to improve grammar and vocabulary.	2	3	7	5	3
	6	I use ChatGPT to rewrite my sentences to sound more academic.	0	2	9	5	4
	7	I use ChatGPT to paraphrase quotations from other sources.	2	4	8	6	0
	8	I use ChatGPT even when I already understand the topic.	5	2	7	5	1
	9	I copy ChatGPT's answers into my assignments without much revision.	2	6	9	2	1
	10	I compare ChatGPT's answers with my own.	0	1	12	6	1

11	I use ChatGPT when I'm working on assignments with tight deadlines.	0	4	6	7	3
12	I feel more comfortable completing assignments with the help of ChatGPT.	1	5	5	7	2
13	I use ChatGPT in almost all of my courses, including Writing.	0	3	11	6	0
14	I use ChatGPT to write complex sentences.	0	4	10	5	1
15	I make ChatGPT my primary tool for completing assignments.	3	6	5	5	1
16	I use ChatGPT to create transitions between paragraphs.	2	8	4	5	1
17	I check the clarity of my arguments with the help of ChatGPT.	2	4	8	4	2
18	I edit my assignments based on feedback from ChatGPT.	1	8	7	3	1
19	I use ChatGPT to find relevant examples.	0	4	8	4	4
20	I rely on ChatGPT more than reading academic references.	3	8	4	4	1
SUM		30	89	144	103	31

Table 1 presents a detailed distribution of students' responses regarding their use of ChatGPT across 20 different academic-related activities. The responses are categorized into five levels, ranging from "Never" to "Always," allowing for a nuanced understanding of how frequently students rely on ChatGPT in various contexts. Overall, the data indicate that most responses fall within the "Sometimes" and "Often" categories, suggesting that ChatGPT is used regularly but not excessively across academic tasks.

A closer examination of the table reveals that activities related to idea generation, understanding assignment instructions, and rewriting sentences into more academic forms tend to receive higher frequency responses. For instance, the number of responses under "Often" and "Always" is relatively high in items such as searching for ideas before writing (Item 2) and rewriting sentences (Item 6), indicating that students commonly use ChatGPT as a supportive tool during the initial and refinement stages of academic work. Similarly, tasks involving comprehension of assignment instructions (Item 1) also show a strong presence in the "Sometimes" and "Often" categories, reflecting students' tendency to rely on AI tools for clarification purposes.

In contrast, activities associated with higher levels of dependency, such as generating entire drafts (Item 4) and relying on ChatGPT more than academic references (Item 20), show a concentration of responses in the "Never" and "Rarely" categories. This pattern suggests that while students actively use ChatGPT, they do not overwhelmingly depend on it for complete task automation. Instead, their engagement appears to be more selective and supportive rather than substitutive.

The aggregated totals at the bottom of the table further reinforce this observation. The highest cumulative responses are found in the "Sometimes" category, followed by "Often," indicating that moderate usage dominates students' interaction with ChatGPT. This distribution highlights a balanced pattern in which students integrate AI tools into their academic processes without fully relinquishing control over their work.

To gain a deeper understanding of gender-based differences in ChatGPT usage, the next analysis focuses on the mean scores and standard deviations for male and female students across all

questionnaire items. This comparison provides insight into both the central tendency and variability of responses within each group.

Table 2. Frequency data analysis based on male and female perspective

Q	MALE		Mean	Std. Deviation	Q	FEMALE		Mean	Std. Deviation
	Valid	Missing				Valid	Missing		
X1	10	0	3,00	1,155	X1	10	0	3,80	0,789
X2	10	0	3,70	0,823	X2	10	0	3,90	0,994
X3	10	0	2,90	0,994	X3	10	0	3,30	1,059
X4	10	0	2,00	0,943	X4	10	0	2,30	0,823
X5	10	0	2,70	1,160	X5	10	0	3,70	1,059
X6	10	0	3,20	0,919	X6	10	0	3,90	0,876
X7	10	0	2,70	0,823	X7	10	0	3,10	1,101
X8	10	0	2,40	1,265	X8	10	0	3,10	1,197
X9	10	0	2,90	0,994	X9	10	0	2,50	0,972
X10	10	0	3,00	0,471	X10	10	0	3,70	0,675
X11	10	0	3,50	0,972	X11	10	0	3,40	1,075
X12	10	0	3,30	1,059	X12	10	0	3,10	1,197
X13	10	0	3,00	0,667	X13	10	0	3,30	0,675
X14	10	0	2,80	0,789	X14	10	0	3,50	0,707
X15	10	0	2,40	1,075	X15	10	0	3,10	1,197
X16	10	0	2,70	1,059	X16	10	0	2,80	1,229
X17	10	0	2,50	1,080	X17	10	0	3,50	0,972
X18	10	0	2,60	0,843	X18	10	0	2,90	1,101
X19	10	0	2,90	0,876	X19	10	0	3,90	0,994
X20	10	0	2,70	1,252	X20	10	0	2,50	1,080

Before interpreting the differences between male and female students, it is important to note that all participants in both groups provided complete responses, with no missing data. This ensures the reliability of the comparative analysis and allows for a consistent interpretation of the results across all variables.

For male students, the mean scores range from 2.00 to 3.70, indicating a moderate level of ChatGPT usage overall. The highest mean score is observed in Item X2, which relates to searching for ideas before starting an assignment (M = 3.70). This suggests that idea generation is the most common purpose for which male students use ChatGPT. This is followed by Item X11 (M = 3.50), indicating that ChatGPT is frequently used when students face tight deadlines, and Item X12 (M = 3.30), reflecting a level of comfort associated with AI-assisted work. These patterns suggest that male students tend to use ChatGPT strategically, particularly in situations requiring efficiency and time management.

Conversely, the lowest mean scores for male students are found in Item X4 (M = 2.00), Item X8 (M = 2.40), and Item X15 (M = 2.40). These items represent behaviors associated with higher dependency, such as generating entire drafts, using ChatGPT unnecessarily, and relying on it as a primary tool. The relatively low scores in these areas indicate that male students generally avoid excessive reliance on ChatGPT and maintain a degree of independence in their academic work.

The standard deviation values for male students range from 0.471 to 1.265, indicating varying levels of response consistency across items. Lower variability in some items suggests relatively uniform behavior, while higher variability in others reflects differences in individual usage patterns. For example, items related to unnecessary use and reliance on ChatGPT over academic reading show higher variability, suggesting that some male students may engage more heavily with AI than others.

In comparison, female students demonstrate a broader range of ChatGPT usage, with mean scores ranging from 2.00 to 3.90. The highest mean scores are observed in Item X2 (M = 3.90) and Item X6 (M = 3.90), indicating that female students frequently use ChatGPT for idea generation and language improvement. Additionally, high mean values in Item X1 (M = 3.80) and Item X13 (M = 3.30) suggest that female students regularly rely on ChatGPT for understanding assignment instructions and integrating it across multiple courses.

The lowest mean scores among female students are found in Item X4 (M = 2.30), Item X9 (M = 2.50), and Item X20 (M = 2.50). Similar to the male group, these items represent behaviors associated with overdependence, indicating that female students also tend to avoid using ChatGPT as a complete substitute for independent academic work. The standard deviation values for female students range from 0.707 to 1.229, indicating moderate variability in responses. Higher variability in certain items suggests that while many female students use ChatGPT frequently, there is still diversity in how they engage with the tool. Some students may rely heavily on ChatGPT, while others use it more selectively. A direct comparison between male and female students reveals several notable differences in ChatGPT usage patterns. Overall, female students consistently report higher mean scores across most academic tasks, indicating more frequent use of ChatGPT. This is particularly evident in tasks related to language enhancement, idea generation, and task comprehension. For example, female students score higher in Item X1, Item X2, and Item X6, suggesting that they are more proactive in using ChatGPT to support their academic writing process.

In contrast, male students demonstrate slightly higher engagement in tasks related to evaluation and comparison, such as comparing their answers with ChatGPT outputs (Item X10) and checking the clarity of their arguments (Item X17). Although these differences are relatively small, they indicate a tendency for male students to use ChatGPT in a more analytical and selective manner. Despite these differences, both groups share similar patterns in avoiding overdependence on ChatGPT. Low mean scores in items related to full automation and excessive reliance suggest that students, regardless of gender, maintain a level of academic autonomy. This indicates that ChatGPT is generally used as a supportive tool rather than a replacement for independent thinking. To further illustrate these gender-based differences, the following figure provides a visual comparison of mean scores across all questionnaire items.

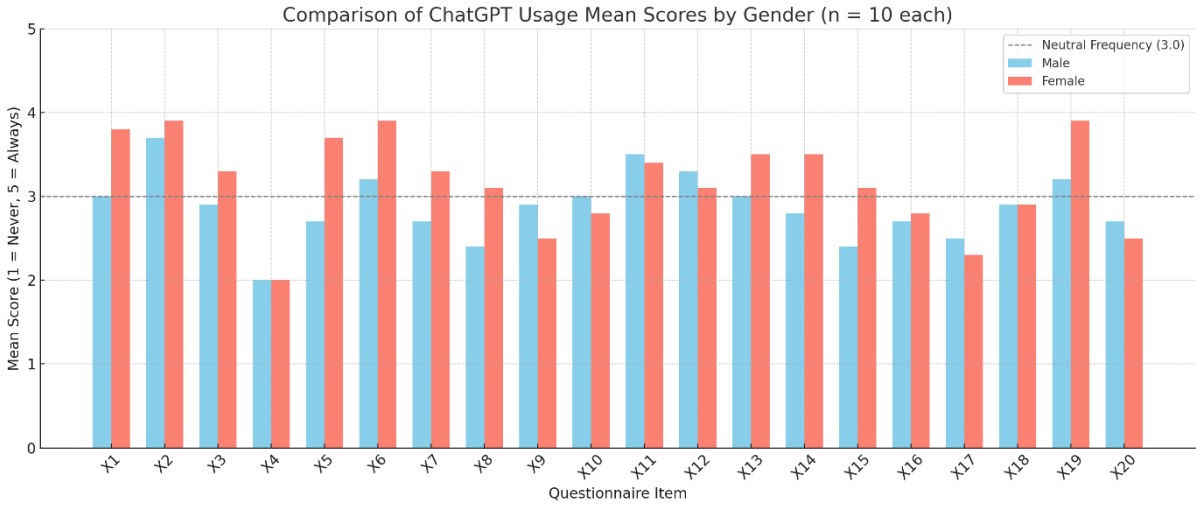

Figure 1. The Comparison of ChatGPT Usage Mean Scores by Gender

Figure 1 visually demonstrates the differences in ChatGPT usage between male and female students across the 20 academic tasks. The graphical representation highlights that female students consistently achieve higher mean scores in most categories, particularly in tasks related to language improvement, idea generation, and understanding assignment requirements. This pattern reinforces the interpretation that female students integrate ChatGPT more extensively into their academic routines. The figure also includes a neutral benchmark line at a mean score of 3.0, which serves as a reference point for interpreting usage frequency. Female students frequently exceed this benchmark, indicating regular engagement with ChatGPT, while male students' scores often remain around or below this threshold, suggesting more moderate usage.

The most significant differences are observed in tasks such as grammar and vocabulary improvement, understanding assignment instructions, and rewriting sentences. These findings suggest that female students rely more on ChatGPT for enhancing the quality and clarity of their academic writing. On the other hand, male students show slightly higher engagement in tasks related to comparison and argument evaluation, although the differences are not substantial. To provide a

clearer summary of the most prominent differences, the following table highlights key focus areas of ChatGPT usage based on gender.

Table 1. The comparison of AI usage frequency based on gender

FOCUS AREA	MEAN		WHO USES MORE	INTERPRETATION
	M	F		
Grammar and vocabulary	2.7	3.7	Female	Females use ChatGPT more to fix grammar and vocab
Understanding assignment instructions	3.0	3.8	Female	Females rely more on ChatGPT to understand tasks
Rewriting sentences to sound academic	3.2	3.9	Female	Females frequently use it for improving academic tone
Using ChatGPT across multiple courses	3.0	3.5	Female	Females use it in more courses than males
Asking ChatGPT to write full drafts	2.0	2.0	Equal	Both genders rarely let ChatGPT write full drafts
Comparing ChatGPT's answers with own	3.0	2.8	Male	Males slightly more often compare answers
Checking argument clarity	2.5	2.3	Male	Males slightly more often check their arguments

Table 3 summarizes the most significant differences in ChatGPT usage between male and female students across selected academic tasks. The data indicate that female students demonstrate higher usage in areas such as grammar improvement, understanding assignment instructions, rewriting sentences, and using ChatGPT across multiple courses. These findings suggest that female students tend to utilize ChatGPT as a comprehensive support tool for enhancing academic writing and comprehension. In contrast, male students show slightly higher usage in tasks related to comparing answers and evaluating argument clarity. Although the differences are relatively small, they suggest a tendency for male students to engage with ChatGPT in a more analytical and evaluative manner.

Interestingly, both groups show identical mean scores in the use of ChatGPT for generating full drafts, indicating that neither group heavily relies on AI for complete task automation. This finding reinforces the overall pattern observed throughout the analysis, where ChatGPT is primarily used as a supportive tool rather than a replacement for independent academic work. In summary, the results demonstrate that female students tend to use ChatGPT more frequently and across a wider range of academic tasks compared to male students. However, both groups exhibit a balanced approach in their use of AI, avoiding excessive dependence and maintaining a level of academic autonomy. These findings highlight the nuanced ways in which students integrate generative AI into their learning processes, reflecting both shared behaviors and gender-specific tendencies in academic contexts.

Discussion

The findings of this study provide important insights into how gender shapes students' engagement with generative artificial intelligence, particularly ChatGPT, in academic contexts. Overall, the results indicate that female students demonstrate a higher frequency of ChatGPT usage across a wider range of academic functions compared to male students. This pattern is especially evident in tasks related to language enhancement, such as improving grammar and vocabulary, understanding assignment instructions, and rewriting sentences to achieve a more academic tone. These findings are consistent with previous studies highlighting that female students tend to utilize AI tools more intensively for language-related and reflective academic tasks (Fadillah & Akbar, 2025). Furthermore, the stronger reliance of female students on ChatGPT for linguistic refinement aligns with prior evidence showing that women often demonstrate greater engagement in tasks requiring detailed language processing and accuracy (Arifin et al., 2025; Azoulay et al., 2025).

In contrast, male students exhibit a more selective and targeted pattern of ChatGPT usage. Their engagement is primarily concentrated on tasks involving evaluation, comparison, and argument validation, such as checking the clarity of their reasoning and comparing their responses

with AI-generated outputs. This finding reflects a more strategic approach to technology use, where ChatGPT is employed as a tool for verification rather than continuous assistance. Such a pattern is consistent with earlier research suggesting that male students tend to approach digital technologies with a focus on efficiency, problem-solving, and analytical purposes (Fadillah & Akbar, 2025; Gefen & Straub, 1997). Although the overall frequency of use among male students is lower than that of female students, their selective engagement suggests a deliberate effort to maintain control over the learning process and to preserve independent critical thinking.

A notable finding of this study is that both male and female students demonstrate relatively low dependence on ChatGPT for full task automation, particularly in generating entire assignments. This pattern is significant in light of ongoing concerns about the potential negative impact of generative AI on students' originality and cognitive engagement. The limited reliance on ChatGPT for complete automation suggests that students are aware of the risks associated with excessive AI use and are able to maintain a balance between AI assistance and independent work. This observation supports broader arguments emphasizing the importance of responsible AI integration in education, where technology is used to enhance, rather than replace, students' intellectual processes (AlAfnan, 2025; Ateeq et al., 2024). It also reflects a level of ethical awareness among students regarding issues of authorship and academic integrity, which have become increasingly central in discussions of AI use in higher education.

The most pronounced gender-based difference identified in this study lies in the domain of language enhancement. Female students show significantly higher engagement with ChatGPT in activities such as grammar correction, vocabulary improvement, and sentence restructuring. This finding reinforces the idea that female students tend to adopt AI tools as supportive resources for improving the quality and clarity of their academic writing. In contrast, male students appear less inclined to use ChatGPT for such purposes, instead prioritizing tasks that involve logical validation and argument assessment. This divergence highlights the role of gender in shaping not only the frequency but also the functional orientation of AI usage in academic settings. Moreover, it suggests that generative AI may be integrated differently into students' learning strategies depending on their cognitive preferences and academic needs (Arifin et al., 2025; Helmiatin et al., 2024).

From a broader perspective, these findings can be interpreted within the framework of ongoing transformations in digital learning environments. The increasing integration of AI tools such as ChatGPT has redefined how students access information, construct knowledge, and complete academic tasks. In this context, the observed gender differences may reflect deeper variations in learning approaches, where female students adopt a more integrative and supportive use of AI, while male students engage in a more instrumental and evaluative manner. This distinction highlights the importance of understanding AI not merely as a technological tool but as a mediator of learning behavior that interacts with individual and social characteristics.

The implications of these findings for educational practice are substantial. First, they suggest that educators and curriculum designers should consider gender-based differences when integrating AI tools into teaching and learning processes. For female students, structured use of ChatGPT in writing and language-related activities may enhance academic performance and confidence. For male students, encouraging broader engagement with AI tools beyond evaluative functions could support more comprehensive learning outcomes. At the same time, it is essential to ensure that AI integration does not lead to overdependence or reduced critical thinking. Therefore, instructional strategies should emphasize balanced use, where AI serves as a complement to, rather than a substitute for, independent learning.

In addition, the findings highlight the importance of promoting ethical awareness and responsible AI use among students. Although both groups demonstrate relatively low reliance on ChatGPT for full automation, the presence of variability in certain behaviors indicates that some students may still be at risk of overdependence. Encouraging critical engagement with AI tools, including evaluating the accuracy and relevance of generated content, is essential for maintaining academic integrity. This aligns with broader concerns regarding students' emotional responses to AI use, such as guilt and ethical conflict, which have been identified as important factors influencing behavior (Qu & Wang, 2025). Addressing these aspects through digital literacy programs and institutional policies can help create a more responsible and reflective learning environment.

Furthermore, the findings of this study can be meaningfully interpreted through the lens of the Technology Acceptance Model (TAM) (Davis, 1989). According to TAM, individuals' adoption and use of technology are influenced by their perceptions of usefulness and ease of use. The higher frequency of ChatGPT usage among female students suggests that they perceive the tool as highly beneficial and accessible, particularly for language-related tasks. In contrast, male students' more selective usage may indicate a more task-specific perception of usefulness, where ChatGPT is employed only when it aligns with their immediate academic needs. This difference in perceived utility highlights how gender may influence not only behavior but also underlying attitudes toward technology adoption.

In addition, Social Cognitive Theory (Bandura, 1982) provides further insight into the observed patterns of behavior. This theory emphasizes the role of self-efficacy, social influence, and observational learning in shaping individual actions. Female students' broader engagement with ChatGPT may be associated with higher self-efficacy in utilizing AI for academic purposes, particularly in language-related domains. Their behavior may also be influenced by peer interactions and shared practices in using AI tools for writing tasks. Conversely, male students' more cautious and selective approach may reflect different self-efficacy beliefs and social expectations, leading them to prioritize independent analysis over extensive reliance on AI. These dynamics illustrate how technological engagement is shaped not only by individual preferences but also by social and cognitive factors.

Overall, this study contributes to a more comprehensive understanding of how gender influences students' interaction with generative AI in higher education. The findings demonstrate that while both male and female students actively use ChatGPT, they do so in distinct ways that reflect different learning strategies, cognitive orientations, and levels of engagement. Importantly, the results also indicate that students maintain a balance between utilizing AI tools and preserving academic independence, suggesting a level of maturity in navigating the opportunities and challenges of AI-enhanced learning. These insights are valuable for informing future research and guiding the development of more inclusive, effective, and ethically grounded approaches to integrating AI into educational contexts.

CONCLUSION

This study set out to examine gender-based differences in the use of ChatGPT for academic purposes among university students. The findings demonstrate that female students tend to use ChatGPT more frequently and across a broader range of academic functions compared to male students, particularly in tasks related to grammar and vocabulary improvement, understanding assignment instructions, and refining academic writing. In contrast, male students show a more selective and strategic pattern of use, primarily engaging with ChatGPT for evaluating arguments and comparing outputs. The most significant difference between the two groups is found in language enhancement activities, where female students exhibit a notably higher level of engagement. Despite these differences, both groups display a relatively low dependence on ChatGPT for complete task automation, indicating that students generally maintain academic autonomy and use AI as a supportive rather than substitutive tool.

These findings suggest that the integration of generative AI in higher education should consider gender-based learning preferences and usage patterns to ensure more effective and equitable implementation. Educators are encouraged to design instructional strategies that promote balanced and critical use of AI, such as guiding students to utilize ChatGPT for idea development and language support while maintaining independent thinking and academic integrity. At the same time, institutions should strengthen digital literacy programs that emphasize ethical awareness and responsible AI use to prevent over-reliance. However, this study is limited to a relatively small sample drawn from two institutions, which may not fully represent broader student populations. Therefore, future research is recommended to explore more diverse contexts and to develop practical models for integrating AI into authentic learning environments while minimizing potential risks associated with excessive dependency.

AUTHOR CONTRIBUTIONS STATEMENT

NN conceptualized and designed the study; SN developed the methodology and conducted the data collection; NN performed the formal analysis and drafted the original manuscript; PR contributed to data interpretation, reviewed and edited the manuscript, and supervised the overall research process. All authors have read and approved the final version of the manuscript.

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