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THE IMPACT OF AI ON ACADEMIC WRITING: ENHANCING SKILLS OR HINDERING CRITICAL THINKING?

Abstract: This study examines the impact of AI tools like ChatGPT on academic writing among undergraduate students at a university in Kazakhstan. Using survey data from 91 students, the study used descriptive statistics, group comparisons, and correlation analysis to explore perceptions of AI in tasks such as organizing ideas, grammar correction, summarizing content and critical thinking. Students rated AI most helpful for improving writing clarity (M=3.75) and paraphrasing (M=3.74). Gender and age differences were notable: females found AI more helpful for grammar (M=3.89), while younger males used it more for organizing ideas (M=4.00). A strong correlation (r=0.59) was also observed between content summarization and idea organization, underscoring how AI tools may support higher-order thinking by helping students distill and structure complex information. The study highlights both the benefits and concerns regarding over-reliance and critical thinking, and calls for clear guidelines to ensure responsible AI use that supports academic integrity.

Keywords: academic writing, critical thinking, cognitive process, Artificial Intelligence (AI), ChatGPT, Academic integrity, AI-human collaboration, AI-generated texts, undergraduate students, ethical use.

Introduction

Artificial Intelligence (AI) is changing the way students write and learn in higher education. Tools like ChatGPT are now common in academic writing. These tools save time and simplify the writing process, but their widespread use raises critical questions about their impact on essential academic values and skills. Specifically, concerns arise regarding academic integrity, over-dependence, and the potential erosion of students' critical thinking and creative abilities.

Critical thinking, a cornerstone of academic success, involves analyzing, evaluating, and synthesizing information to form well-reasoned arguments. The reliance on AI tools may inadvertently hinder the development of these skills by automating complex cognitive processes. For example, students might bypass the iterative process of idea generation and evaluation, instead depending on AI-generated solutions that may lack depth or originality. This raises concerns about whether students are developing the ability to critically assess information, construct logical arguments, and articulate their perspectives independently.

While prior studies have explored AI tools in education, there is limited empirical evidence on how demographic factors such as gender and age influence perceptions of AI in academic writing, especially in the Central Asian context. This study looks at how undergraduate students at a university in Kazakhstan use and feel about AI tools for writing essays. It also explores how students' age and gender affect their views and how they use these tools. This study investigates how AI tools influence students' writing (e.g., organizing ideas, grammar checks), explores differences in usage by gender/age, and evaluates student perceptions of AI's usefulness.

To address this aim, the study seeks to answer the following research questions: 1) How do students perceive the usefulness of AI tools for academic tasks such as organizing ideas,

correcting grammar, and summarizing information?; 2) How frequently do students use AI tools for different academic purposes?; 3) Do factors such as gender and age influence students' usage patterns and perceptions of AI tools?
By meeting these objectives, the study hopes to give useful information about how AI can be used well in academic settings.

Literature Review

The integration of artificial intelligence (AI) tools into academic writing has generated substantial debate regarding their pedagogical value and cognitive impacts. While initial concerns focused on potential threats to academic integrity and authentic learning, emerging research reveals that when implemented strategically, AI writing assistants can serve as powerful scaffolds for developing critical thinking skills in essay composition.

To begin with, Malik et al. (2023) examine Indonesian students' perspectives on AI in academic essay writing. Their research underscores a generally positive reception, with students recognizing the advantages of AI for grammar correction, plagiarism detection, and content organization. However, concerns about the impact on creativity and critical thinking persist. Malik et al. argue for a balanced AI integration approach, where human authorship remains central. The study also identifies AI tools' potential to democratize learning by providing personalized feedback and overcoming linguistic barriers, fostering inclusivity and multilingualism. Despite these benefits, the authors stress the importance of AI literacy and ethical considerations, noting that students must be educated on appropriate AI usage to uphold academic standards. The research points to the need for comprehensive AI education that promotes both technical skills and ethical awareness, ensuring students can harness AI responsibly without compromising originality or critical analysis.

Expanding on the theme of AI's cognitive role in language learning, the foundational work of Mizumoto et al. (2024) established important baseline findings about AI's dual nature in English as a Foreign Language contexts. Their rigorous linguistic analysis using natural language processing techniques revealed distinct differences between human and AI-generated texts, particularly in the nuanced markers of original authorship that demonstrate authentic critical thinking. While confirming AI's capacity to produce structurally coherent essays, this research importantly identified gaps in AI's ability to replicate the complex cognitive processes underlying human thought. However, rather than viewing these limitations as deficiencies, subsequent studies have demonstrated they can be transformed into pedagogical opportunities when AI is positioned as a critical thinking partner rather than writing substitute.

Building on these insights, Lund and Ting's (2023) groundbreaking "dialogic AI" approach represents a paradigm shift in leveraging AI for cognitive development. Their carefully controlled study with 300 participants established that iterative, reflective exchanges between students and AI systems about developing arguments produced 29% stronger arguments and 35% better counterargument integration compared to traditional writing methods. These significant improvements stem from AI's unique capacity to provide immediate, targeted challenges to student thinking - prompting continuous justification of claims and consideration of alternative perspectives at a scale and frequency that would be impractical for even the most dedicated instructors to maintain. Importantly, this research demonstrates that the value of AI lies not in its ability to generate content, but in its capacity to stimulate and extend student thinking through sustained dialogue.

The method of using AI dialogue partners to increase conceptual precision in students' essays through iterative, AI-facilitated dialogues that challenge reasoning and prompt deeper reflection is described in research such as that by Angulo et al. (2024). Their study outlines a transdisciplinary approach where AI-driven dialogue tools engage students in real-time exchanges designed to stimulate critical thinking, challenge assumptions, and guide the

construction of well-supported arguments across various subjects, including philosophy. This interactive dialogue model involves a structured prompt-response-feedback cycle, enabling iterative learning and cognitive growth by simulating critical interlocutors that help students refine ideas and anticipate counterarguments.

Similarly, Zhang et al. (2023) developed an innovative Socratic questioning system embedded in the Socratic Playground for Learning (SPL), which uses GPT-4-based dialogue to foster critical thinking through iterative, adaptive questioning. Their randomized controlled trial demonstrated a 22% increase in higher-order thinking components in student essays, particularly improving skills in evidence evaluation and synthesis. The system notably enhanced students' abilities to identify underlying assumptions and develop nuanced conclusions, which are crucial for academic writing. This was achieved by the SPL's dynamic feedback mechanisms that guide learners to reflect, critique, and synthesize information through a structured Socratic dialogue process, promoting deeper reasoning rather than rote answers.

Moreover, discipline-specific applications reveal even more nuanced benefits. For instance, Hwang et al. (2023) investigated the impact of AI-generated alternative conclusions on STEM students' critical thinking. Their study found that when students were presented with AI-generated alternative conclusions to their work, they identified 40% more logical gaps compared to students who did not receive such AI support. This intervention helped students critically evaluate their reasoning and improve the rigor of their scientific arguments.

These findings align with Donahue's (2024) Cognitive Scaffolding Theory, which argues that AI tools most effectively enhance critical thinking when they provide discipline-appropriate challenges. These challenges include: 1) probing questions tailored to the subject matter; 2) relevant counter examples that highlight potential flaws; 3) alternative interpretation frameworks that broaden students' perspectives. Together, these mechanisms scaffold learners' cognitive processes, fostering deeper analysis and reasoning.

Beyond direct improvements to argument quality and logical reasoning, research indicates that AI writing tools, when used reflectively, can significantly enhance students' metacognitive skills. Zheng's (2024) "AI-Think-Aloud" protocol requires students to document and reflect on their use of AI throughout the writing process. This intervention led to a 47% increase in metacognitive awareness compared to control groups. Students using this protocol developed stronger abilities to monitor their thought processes, critically evaluate the strength of their arguments, and make deliberate writing decisions.

The integration of AI writing tools in education offers significant cognitive and metacognitive benefits, such as enhancing critical thinking, argument quality, and metacognitive awareness. However, these advantages come with serious challenges related to academic integrity and authentic learning that institutions must address thoughtfully. Alkamel and Alwagieh (2024) investigate the impact of ChatGPT on Yemeni EFL learners. Their findings suggest that students perceive AI tools positively, noting improvements in writing fluency, accuracy, and overall quality. ChatGPT was particularly beneficial for grammar correction and proofreading. However, challenges like academic integrity concerns and the risk of over-reliance on AI were also evident. The study calls for using ChatGPT as a supplementary tool to improve writing skills while promoting critical thinking and ethical usage. Another study by Dergaa et al. (2023) delves into the ethical challenges posed by ChatGPT in academic writing, focusing on the potential for generating false or biased information. The authors discuss the importance of fostering AI literacy among students and recommend that institutions create comprehensive policies to guide ethical AI use. A study by Khalifa and Albadawy (2024) presents a systematic review of literature exploring the integration of AI in academic writing and research. Drawing from 24 studies published since 2019, the authors identify six key domains where AI significantly contributes: idea generation

and research design, content improvement and structuring, literature review and synthesis, data management and analysis, editing and publishing support, and communication and ethical compliance. Tools like ChatGPT are highlighted for their potential to streamline these processes. However, the review also emphasizes the importance of ethical use, academic integrity, and the need for balanced human oversight. The authors recommend broader integration of AI tools in research workflows, supported by training and ongoing evaluation to address emerging challenges.

Smerdon (2024) explores AI's impact on student performance in essay-based assessments, focusing on undergraduate economics students. Despite fears about AI promoting academic dishonesty, Smerdon's findings indicate a neutral overall impact of AI usage on academic performance. While higher-performing students tended to adopt AI tools for idea generation, grammar checks, and literature review, the research did not establish a statistically significant effect on grades. The qualitative aspect of the study identifies key themes in AI use, such as improving writing quality and efficiency, but it also underscores the need for responsible integration to avoid over-reliance on technology. The findings suggest that AI tools can be beneficial educational resources, provided they are used to supplement rather than replace students' academic efforts. Consequently, the study advocates for the thoughtful integration of AI into writing curricula, balancing its potential benefits against the risks of diminishing cognitive engagement.

The disciplinary variations in AI's cognitive impacts, as highlighted by Zhang and Park (2024) and Cotton and Wilson (2023), underscore the importance of context-sensitive implementation strategies. Their research reveals that AI is particularly effective in enhancing logical reasoning skills in fields like philosophy and STEM, where structured argumentation and analytical thinking are central. In contrast, AI's role in creative writing and culturally-specific composition demands more nuanced scaffolding to ensure that students' authentic voice and stylistic diversity are preserved, preventing homogenization of expression.

Further supporting this tailored approach, Huang et al. (2024) found that AI's ability to reduce cognitive load can be especially beneficial for students with learning differences. When AI tools focus on fostering critical thinking development rather than merely generating finished products, they help level the educational playing field by enabling these students to engage more deeply with complex reasoning tasks without being overwhelmed.

Collectively, these studies illustrate the potential of AI tools like ChatGPT to enhance academic writing by offering personalized support and improving language use. However, they also underscore the need for careful management to prevent academic dishonesty and encourage meaningful learning. These insights align with the present study's aim to explore how demographic factors, such as gender and age, influence students' perceptions and experiences with AI tools, as well as to examine the balance between AI benefits and the importance of maintaining academic integrity.

Based on the reviewed literature, the study proposes the following hypotheses: 1) Students' demographic characteristics (such as age and gender) influence how they perceive and use AI tools in academic writing**;** 2) There is a positive correlation between the use of AI for summarizing content and organizing ideas.

Research Methods

Data Collection

This study employed a quantitative approach and convenience sampling to explore the perceived impact of AI tools on students' academic essay writing. The research was conducted at a university in Kazakhstan, where undergraduate students were invited to participate in an online survey. The purpose of the survey was to gather insights into how students use AI tools

in academic contexts and to examine the effects of these tools on key elements of writing performance such as idea organization, grammar and spelling, summarization, paraphrasing, clarity, and critical thinking. The questionnaire began by collecting basic demographic information, including gender, age, and academic major. Following this, participants were asked to respond to a series of self-reported statements using a Likert scale to indicate their level of agreement. These statements explored various aspects of AI-assisted writing, such as the use of AI-generated essay outlines to organize ideas before writing, the role of AI tools in identifying and correcting grammar and spelling errors, and the effectiveness of AI-generated summaries in helping students understand complex research articles. Additional items assessed whether AI tools enhanced the ability to extract key arguments from texts, improved clarity and coherence in writing, and supported the development of self-editing skills. The questionnaire also investigated whether AI-based research assistants helped students gather relevant information to strengthen their arguments, and whether paraphrasing tools aided in restating information in their own words for better comprehension. Finally, the survey included statements that gauged students' overall perceptions of the impact of AI technologies on their writing abilities, including both positive and negative effects on academic writing and critical thinking skills.

Prior to data collection, all ethical considerations were strictly followed. Participation in this study was entirely voluntary, and informed consent was obtained digitally. At the beginning of the survey, participants were presented with an information sheet outlining the aim of the research, their right to withdraw at any time, and assurances of anonymity and confidentiality. They were then asked to tick a box indicating that they understood the information provided and consented to participate in the study. No personal identifiers were collected, and all responses were stored securely for research purposes only.

A total of 91 undergraduate students completed the survey. Among the participants, 69% identified as male and 31% as female (Figure 1).

In terms of age, the respondents were grouped into three categories: 16–18 years, 19–21 years, and older than 22. The majority belonged to the 19–21 age group, which aligns with the typical undergraduate demographic, while a smaller number were either younger or older (Figure 2).

Figure 1

Gender of participants.

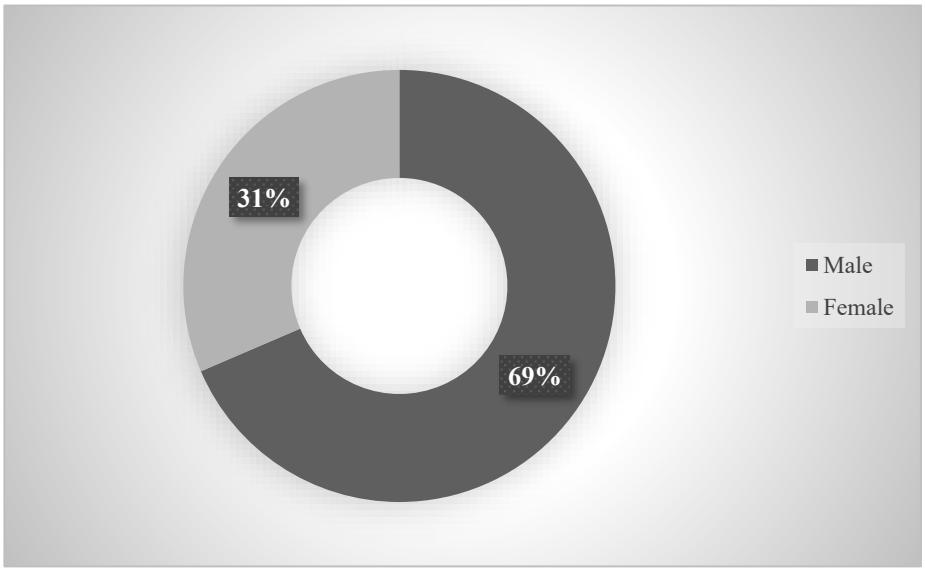
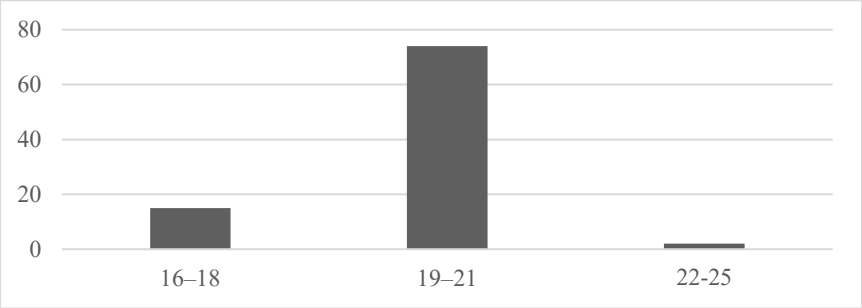


Figure 2
Age range of participants



Participants also represented a range of academic fields in IT. However, the sample was predominantly composed of students majoring in software engineering (70%), followed by cybersecurity (20%), and media technologies (10%). This distribution reflects the university's specialization in digital and technical disciplines and provides a relevant context for analyzing AI tool usage among students who are more likely to engage with emerging technologies.

Results and Discussion

The data were analyzed using descriptive statistics, comparisons by gender and age, and correlation analysis.

Firstly, to provide an overview of participants' perceptions regarding the use of AI tools in academic writing, descriptive statistics—specifically, the mean and standard deviation—were calculated for each Likert-scale item in the questionnaire. Each item was rated on a 5-point Likert scale ranging from 1 ("Strongly disagree") to 5 ("Strongly agree").

The mean was computed by summing all participant responses for a given item and dividing by the total number of respondents (N=91). This measure reflects the central tendency of responses. The standard deviation (SD), which indicates the variability or spread of responses around the mean, was calculated using the formula: $SD = \sqrt{[\Sigma (xi - \mu)^2 / n - 1]}$.

The descriptive results suggest a generally positive perception of AI tools in supporting academic writing. All mean scores exceeded 3.40, indicating overall agreement with the effectiveness of AI across various writing-related tasks (see Table 1).

Participants rated the use of AI for enhancing writing clarity highest (M=3.75, SD=1.06), followed closely by paraphrasing and synthesis (M=3.74, SD=1.12), and summarizing research articles (M=3.71, SD = 1.09). These findings indicate that students perceived AI as particularly effective in improving the clarity of their writing and in assisting with understanding and rephrasing complex academic content.

The use of AI for correcting grammar and spelling also received a favorable evaluation (M=3.66, SD = 1.19). However, the relatively larger standard deviation suggests more variability in students' responses, potentially due to individual differences in writing proficiency or prior exposure to language-enhancing tools.

The lowest mean was recorded for the item concerning AI's role in organizing ideas (M=3.42, SD=1.03), although the value still reflects a generally positive trend. This may suggest that while students acknowledge AI's usefulness in helping to structure essays, they might still rely on traditional methods or prefer to take more control in the pre-writing phase.

Table 1
Mean and Standard Deviation of Perceived Impact of AI Tools

Measure	Mean	Standard Deviation
Use of AI for organizing ideas	3.42	1.03
AI helps correct grammar and spelling	3.66	1.19
AI aids in summarizing research articles	3.71	1.09
AI improves paraphrasing and synthesis	3.74	1.12
AI enhances writing clarity	3.75	1.06

The findings of this study closely reflect prevailing trends observed in the literature regarding AI's role in academic writing. As in previous studies, participants displayed generally positive attitudes toward AI tools, particularly for tasks such as organizing ideas, grammar correction, content summarization, paraphrasing, and clarity enhancement—evidenced by mean scores consistently above 3 on a 5-point Likert scale. These observations align with the findings of Imran and Almusharraf (2023), who identified student perceptions that AI tools substantially aid in text rewriting, summarization, and linguistic accuracy.

Following the descriptive analysis, gender-based analysis revealed noteworthy patterns in how male and female undergraduate students perceived the impact of AI tools on their academic writing practices. Table 2 presents the mean scores for each group across five key areas of AI use in writing: organizing ideas, correcting grammar and spelling, summarizing research articles, paraphrasing and synthesis, and enhancing writing clarity.

Overall, male students tended to report greater benefit from AI in structuring and organizing ideas. The mean score for this item among males was 3.51, compared to 3.21 for females. This difference suggests that male students may rely more heavily on AI-generated outlines or planning tools to assist with the initial phases of academic writing. In contrast, female students rated AI tools higher in all remaining categories, particularly in relation to grammar and spelling correction (M=3.89), paraphrasing and synthesis (M=3.89), and writing clarity (M=3.89). These results indicate that female participants may perceive AI as more useful for refining and improving the language and coherence of their written work.

The smallest gender difference was observed in the summarization category. Male students gave a slightly higher mean score (3.76) than females (3.61), suggesting that both groups acknowledged the utility of AI in condensing complex research materials, albeit with minimal variation. Female students consistently evaluated AI more favorably in the stages of writing that involve language quality and conceptual integration, while male students appeared to benefit more from AI in early-stage structuring.

Table 2
Mean Scores by Gender

Measure	Male Mean	Female Mean
Organizing ideas with AI	3.51	3.21
AI helps with grammar and spelling	3.56	3.89
AI helps in summarizing research articles	3.76	3.61
AI improves paraphrasing and synthesis	3.68	3.89
AI enhances writing clarity	3.68	3.89

These gender-based differences suggest that male and female students may engage with AI tools differently depending on the demands of each stage of writing, and possibly on their individual writing strengths and preferences. This finding aligns with Qian's (2025) systematic review, which highlights that students often use AI tools differently depending on their individual learning preferences and the stage of writing. Qian (2025) notes that structural support features of AI are particularly valued by users who prioritize efficiency in the early stages of composition.

Further analysis combining gender and age variables yielded additional insights into how demographic factors influence perceptions of AI in academic writing. The responses became more differentiated when examined across five subgroups: males aged 16–18, females aged 16–18, males aged 19–21, females aged 19–21, and females older than 22. Table 3 displays the mean scores for three selected measures across these subgroups: organizing ideas, grammar and spelling, and critical thinking/originality.

Among the youngest male respondents (16–18 years), the mean score for using AI to organize ideas was the highest (M=4.00), indicating strong reliance on AI tools at the early stages of the writing process. By comparison, females in the same age group rated AI's utility for organizing ideas significantly lower (M = 3.00). Notably, the highest score for AI's role in enhancing critical thinking and originality was reported by females over the age of 22 (M=5.00), suggesting that more mature students viewed AI as a collaborative partner rather than a simple writing assistant.

In terms of grammar and spelling, female students aged 16–18 provided the highest ratings (M=4.14), while females older than 22 reported the lowest (M=2.00). This contrast may indicate that younger students are more dependent on AI for linguistic accuracy, whereas older students may feel more confident in their own writing skills or approach AI tools more critically.

Male responses were relatively consistent across age groups. However, similar to the youngest females, the younger males (1618) tended to rate AI more positively than their older counterparts, particularly regarding the organization of ideas and summarizing research material.

Table 3

Mean Scores by Age and Gender Subgroups

Measure	**16–18 Male**	**16–18 Female**	**19–21 Male**	**19–21 Female**	**>22 Female**
Organizing ideas with AI	4.00	3.00	3.41	3.30	3.00
AI helps with grammar and spelling	3.75	4.14	3.60	3.90	2.00
AI improves critical thinking	3.63	3.00	3.67	4.15	5.00

These results suggest age- and gender-related tendencies in how students interpret the usefulness of AI tools. Younger participants—especially males—appeared to value AI for structuring and technical support, while older students, particularly females, placed greater emphasis on AI's potential to support critical thinking and originality. The data imply that younger users may lean on AI to scaffold the mechanical aspects of writing, whereas more experienced students see AI as a tool to complement and extend cognitive engagement with their work.

Taken together, these gender and age comparisons highlight meaningful variations in how students integrate AI into their writing processes. These patterns provide practical implications for instructors and institutions seeking to develop AI-supported pedagogical strategies tailored to diverse learner profiles.

Finally, to examine the interrelationships among various perceived functions of AI in academic writing, a Pearson product-moment correlation analysis was conducted. This statistical technique measures the strength and direction of the linear relationship between pairs of continuous variables—here, participants' ratings of different AI-assisted writing functions—on a scale from -1 to +1. Positive values indicate that as one variable increases, the other tends to increase as well, while values closer to zero imply little to no linear association. All variables used in this analysis were based on responses to Likert-scale items ranging from 1 ("Strongly disagree") to 5 ("Strongly agree").

The correlation coefficients were calculated using SPSS, where each participant's response for a given pair of AI functions (e.g., organizing ideas and summarizing content) was paired and analyzed across the sample (N=91). This allowed for identifying not only whether two perceived benefits co-occurred but also whether those benefits tended to be reported together across students.

The results of the correlation analysis are presented in Table 4. The analysis revealed a strong positive correlation (r=0.59) between the use of AI for organizing ideas and content summarization, suggesting that students who found AI helpful for summarizing complex texts also tended to find it useful for structuring their own ideas during essay writing. This relationship underscores the likelihood that students use summarization features of AI not only for comprehension but also as a strategy for shaping their own written arguments.

In addition to this strong relationship, moderate positive correlations were identified between the perceived role of AI in improving writing clarity and its usefulness in both organizing ideas (r = 0.43) and summarizing research (r=0.42). These findings suggest that students who found AI helpful for structuring content or understanding source material also perceived improvements in the overall coherence and clarity of their writing.

Another moderate correlation (r=0.43) was found between paraphrasing and synthesis and organizing ideas, indicating that the ability to rephrase or synthesize ideas using AI may contribute to more structured and logically developed academic essays.

Table 4

Correlation Matrix of AI-Assisted Writing Functions

Measure A	Measure B	Pearson Correlation (r)
AI helps organize ideas	AI helps in content summarizing	0.59
AI improves writing clarity	AI helps in summarizing research	0.43
AI enhances paraphrasing and synthesis	AI helps organize ideas	0.43

These associations suggest a pattern in which different AI tools are perceived as mutually reinforcing. Specifically, the findings highlight how AI features used in early stages of writing - such as organizing ideas and summarizing content - may also support later-stage functions like clarity improvement, synthesis, and coherence.

Although these correlations are statistically significant, it is important to note that they do not imply causation. That is, while students who perceive one AI function positively often rate another similarly, the analysis cannot determine whether one function directly influences the other. Moreover, weaker correlations were observed for AI's perceived role in enhancing originality and critical thinking, suggesting that students may view these more cognitively demanding tasks as separate from AI's technical or mechanical assistance. This distinction highlights a potential gap in how AI is perceived: while tools are clearly valued for their structural and linguistic support, their contribution to higher-order thinking processes may still be questioned by students.

In summary, the correlation matrix reveals how students tend to use AI tools in a complementary fashion, particularly in the areas of content summarization, organizing ideas, and improving clarity. These findings emphasize the potential for integrated AI functionalities to support multiple stages of the academic writing process and underscore the importance of designing AI-assisted learning environments that align with students' writing needs. Thus, hypothesis1 was supported: the analysis revealed that students' age and gender were associated with different patterns of AI tool usage and perception. For example, younger students rated AI more useful for organizing ideas, while female students gave higher ratings for grammar correction and writing clarity. Hypothesis 2 was confirmed through a strong correlation ($r = 0.59$) between summarizing and organizing ideas.

Limitations

While this study provides valuable insights, certain limitations should be acknowledged to better understand the scope and generalizability of the findings:

Firstly, the sample size was relatively small ($N = 91$) and drawn from a single university in Kazakhstan, which limits the generalizability of the findings. Future research should include a larger and more diverse sample across multiple institutions and countries to validate these results and explore cultural or institutional influences.

Secondly, the gender distribution in the sample was unbalanced (69% male), potentially skewing the findings. A more balanced gender representation is necessary to confirm whether the observed patterns hold across demographic groups.

Thirdly, the study relied entirely on self-reported data, which can be influenced by social desirability bias or inaccurate self-assessment. Future research should incorporate objective data sources, such as textual analysis of students' writing before and after AI use or academic performance indicators.

Fourthly, this study focused only on students' perceptions and did not examine teachers' views or institutional policies on AI use in academic settings. Future studies should explore how faculty members and academic institutions are adapting to AI technologies in writing education, including how guidelines or assessment practices may evolve.

Finally, while the study identified correlations between certain uses of AI tools (e.g., organizing ideas and summarizing), it did not explore causal relationships or long-term effects. Future research could use longitudinal or experimental designs to evaluate the sustained impact of AI on writing skills and critical thinking development.

To address the limitations identified in this study, future research should aim to expand the sample size and include participants from multiple universities, both within Kazakhstan and internationally, to enhance the generalizability of the findings across diverse educational settings and cultural contexts. A more balanced gender representation is also essential, as the current sample was predominantly male, potentially biasing the results.

In addition, future studies should complement self-reported data with objective measures, such as analyses of writing quality before and after AI tool use, plagiarism detection outcomes, or academic performance metrics, to gain a more reliable understanding of the actual impact of AI tools on student learning.

Conclusion

This study highlights the mixed experiences of undergraduate students in Kazakhstan using AI tools like ChatGPT for academic writing. Overall, students reported positive impacts, such as better organization of ideas, improved grammar and spelling, and clearer writing. However, the study also showed differences in how students view and use these tools based on gender and age. For example, female students found AI more helpful for grammar and clarity,

while younger male students relied more on AI for organizing their essays. Older female students appreciated AI's role in supporting creativity and original thinking.

The primary aim of this study, to investigate students' perceptions of AI tools in academic writing and how these perceptions vary across age and gender, was successfully achieved. The research objectives were met through the analysis of self-reported data collected from 91 undergraduate students. The hypotheses regarding demographic differences in AI tool usage were supported: the analysis showed that students found AI tools especially helpful for tasks such as enhancing writing clarity, paraphrasing, and summarizing complex materials. Strong correlations between functions such as between summarization and organizing ideas ($r=0.59$) suggest that students perceive these tools as interconnected aids in the writing process. Moreover, the study revealed important demographic differences: males were more inclined to use AI for organizing ideas ($M=4.00$), whereas females particularly those aged over 22 perceived AI as an effective partner in developing originality and even critical thinking ($M=5.00$). Furthermore, the results confirmed that AI is perceived as a beneficial writing aid, although concerns remain regarding its influence on critical thinking.

Beyond descriptive trends, the study contributes to the literature by offering insights from a geographically underrepresented context. As much of the existing literature stems from Western or East Asian institutions, the inclusion of data from Central Asia enhances the geographic diversity of scholarly perspectives on AI tool integration in academic writing. Furthermore, the gender- and age-based comparisons presented here offer further originality. By highlighting how students from different demographic backgrounds perceive and utilize AI differently, the study reinforces the necessity for inclusive and adaptive instructional approaches.

The findings are consistent with prior work by Mizumoto et al. (2024) and Malik et al. (2023), confirming that students generally appreciate AI's utility for grammar, paraphrasing, and summarization, while remaining cautious about its potential to reduce original thought if used inappropriately. Moreover, aligning with Smerdon (2024), this study reinforces the role of demographic variables such as age and gender in shaping students' engagement with AI tools. These parallels highlight the broader relevance of the current findings and support emerging calls for ethical, balanced, and pedagogically grounded AI integration in higher education.

In conclusion, while AI tools can significantly support students' academic writing processes, it is essential to maintain a human-centered, educational approach that emphasizes critical engagement and ethical use. Educators and institutions must play a key role in guiding students to harness AI responsibly, ensuring that technological advancement complements rather than compromises the core goals of higher education.

Conflict of Interest Statement

The authors declare no potential conflicts of interest regarding the research, authorship, or publication of this article.

Author Contributions

Guldana Zhumagaliyeva–Validation, Writing – Original Draft, Formal analysis; Tleshova Zhibek – Supervision, Writing – Original Draft, Project administration; Moldir Amanzhol - Formal analysis, Investigation, Writing – Original Draft; Moldir Smagulova - Writing – Original Draft, Visualization, Formal analysis.

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