Research Article

The use of AI tools in English academic writing by Saudi undergraduates

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ARTICLE INFO	ABSTRACT
	This study explores Saudi undergraduate students' perceptions of artificial intelligence (AI) tools in academic writing. Despite extensive research on AI in higher education, there is limited focus on academic writing, especially in the Saudi context. A survey of 189 students, proficient in English and enrolled in freshmen academic writing courses, was conducted. The students frequently used ChatGPT, Grammarly, and Google Translate. Exploratory factor analysis identified two factors: "instructional support of AI tools" and "instructional practices of AI tools," explaining 55.302% of the variance. Descriptive analysis revealed strong student agreement on AI tools' benefits, including idea generation, outline preparation, grammar and spell-check improvements, and time-saving. However, concerns about reliability, contextual accuracy, and ethical implications were noted. The study indicates the need for proper training and clear guidelines to make the most of AI in academic writing. The participants, in various responses, indicated how AI helps develop their writing accuracy and come up with new ideas although some participants worry about relying too much on technology. The study recommends that AI tools can be very helpful, but we need to use them thoughtfully to cater to different student experiences and concerns. **Keywords:** AI tools, academic writing, undergraduate students

INTRODUCTION

The artificial intelligence (AI) has largely influenced many fields, particularly the field of education (e.g., Imran & Almusharraf, 2023, 2024; Lange & Costley, 2020). Among the many applications of AI, tools designed to help in academic writing have increased prominence. These AI tools are especially helpful for undergraduate students who are still developing their writing skills because they provide features like grammar checking, plagiarism detection, and even article generation. AI in academic writing has the ability to improve student work quality and expedite the writing process. However, the attitudes and opinions of the students who use these tools will determine their acceptability and efficacy. In order to better understand undergraduate students' opinions of AI tools for academic writing, this study will examine how undergraduate students in Saudi Arabia perceive these tools' overall usefulness, usability, and impact on the writing process. To make sure that these technologies are effectively supporting student learning and skill development, educators and tool makers must have a thorough understanding of these views.

LITERATURE REVIEW

Several studies have explored the perceptions of both students and instructors of the use of AI tools in higher education (e.g., Almaraz-López et al., 2023; Chan & Hu, 2023; Dempere et al., 2023), in general, and in language education (e.g., Irwin, 2024; Widianingtyas et al., 2023; Zimotti et al., 2024), in particular. However, much fewer studies have focused on the academic writing classes in higher education. This is an area that is worthy of extensive attention because academic writing is a conspicuously daunting task for university students (e.g., Dunn, 2021; Lin & Morrison, 2021) and because the variety of available AI tools holds promise for providing ongoing support to students in their learning journey of academic writing (e.g., Nazari et al., 2021; Nguyen et al., 2024).

Most studies on the students' perceptions of AI tools in academic writing classes have focused on particular tools (El-Dakhs et al., 2023; Fayez et al., 2023; Ozfidan & El-Dakhs, 2023). For example, a few studies were conducted in Indonesia on the perceptions of university students towards the use of Quillbot, an AI-powered platform that is designed to enhance writing through a variety of tools that support paraphrasing, summarizing, translating, and detecting plagiarism. In this context, Kurniati and Fithriani (2022) found that post-graduate students exhibited positive attitudes toward the use of Quillbot in their academic writing classes and considered it as a useful tool to enhance their attitudes toward writing, provide a variety of user-friendly writing features and aid their language development. Similarly, Syahnaz and Fithriani (2023) noted positive perceptions among undergraduate students toward the use of Quillbot. The undergraduate students appreciated Quillbot's assistance in improving the content and arguments in their writing, reducing their grammatical errors and improving the quality of their language. Further support for students' positive perceptions toward the use of Quillbot came from the work of Nurmayanti and Suryaki (2023) who highlighted that students preferred to use this AI-powered platform primarily to paraphrase text, produce well-organized academic writing, and avoid plagiarism.

Another tool that attracted the attention of several scholars is ChatGPT, which is a chatbot based on a large language model that was launched by OpenAI on November 30, 2022. Ever since its launch, researchers have been keen to examine its applications in academic writing classes in different parts of the world. In the USA, Barrett and Pack (2023) collected survey responses from 158 university students to explore their perceptions on the appropriate use of ChatGPT in the writing process. Most students viewed the use of ChatGPT as more acceptable in the early stages of the writing process (e.g., brainstorming and outlining) than in later stages. That is, ChatGPT was viewed as more acceptable when it was fulfilling a supportive role focused on idea generation and organization rather than used as an automatic writing completion tool. The study highlighted the need for explicit guidelines on the use of such generative AI tools in educational contexts. A similar study was conducted by Wang (2024) who examined students' perceptions of the use of ChatGPT throughout different components of the writing process. The focus of this study was on first-year university students who often face great difficulty coping with the demands of academic writing. The results of various qualitative measures suggested that students used ChatGPT for brainstorming and organizing ideas as well as assisting with both global (e.g., argument, structure, coherence) and local issues of writing (e.g., syntax, diction, and grammar). However, the students expressed concerns regarding the challenging balance between expressing their authorial voice and the integration of ChatGPT in the writing process and regarding the potential loss of some important learning experiences due to the emergence of new technological experiences. The author emphasized the importance of fostering students' critical AI literacy to promote their authorial voice and learning.

In addition to the USA, researchers around the world have attempted to explore students' perceptions towards the use of ChatGPT in writing. For example, Song and Song (2023) employed a combination of quantitative and qualitative measures to explore the Chinese students' writing motivation and experience with the ChatGPT. The quantitative measures revealed that the students who received AI-assisted instruction demonstrated better command in various aspects of writing, including organization, coherence, grammar, and vocabulary, than the control group. The qualitative measures suggested that students were aware of the positive influence of ChatGPT on their writing skills and motivation. However, they expressed concerns about the contextual accuracy of the tool and the potential over-reliance on its use. The author recommended that EFL educators and teachers establish dedicated AI-supported language learning classes to train EFL learners

how to effectively utilize AI tools to improve their writing skills. Likewise, Bibi and Atta (2024) examined the Pakistani students' involvement with ChatGPT as an AI-powered English writing assistant. Using a mixed-method approach, the study revealed that students had an overall favorable opinion of ChatGPT and that they viewed it as a credible and trustworthy tool to facilitate faster and more effective writing. The students generally believed that ChatGPT enhanced their writing productivity, increased their confidence in writing in English and assisted them in improving their basic English writing skills. However, some students expressed concerns regarding the tool's provision of unauthentic and unreliable content that requires cross-checking. Like Song and Song (2023), Bibi and Atta (2024) emphasized the importance of providing training on the use of such technological tools to students.

In the same vein, Özçelik and Ekşi (2024) and Chauke et al. (2024) examined how ChatGPT is used to support university students' writing in Turkey and South Africa, respectively. Özçelik and Ekşi (2024) particularly focused on the impact of ChatGPT on the acquisition of register knowledge across various writing tasks by Turkish students. The results indicated that while students found ChatGPT beneficial for acquiring formal register knowledge, they found it unnecessary for informal writing and questioned its usefulness in teaching the neutral register. The students also emphasized the need for significant functional improvements to ChatGPT to make it a more useful tool for self-editing. The authors concluded that ChatGPT can provide significant assistance to students in their writing tasks with careful evaluation and modification. As for Chauke et al. (2024), they examined the use of ChatGPT by postgraduate students in South Africa. Using a qualitative methodology, the study showed that the students appreciated the usefulness of ChatGPT in refining their research topics, identifying their grammatical errors and paraphrasing their academic writing. Thus, ChatGPT was generally perceived as a tool that significantly contributes to the enhancement of the students' academic writing skills. The authors called for the development of clear ethical guidelines for the use of AI tools in universities.

In addition to these studies that focused on specific AI tools (e.g., Quillbot and Chatbot), a few studies have attempted to examine students' perceptions of a variety of AI tools in combination. A case in point is Utami et al. (2023) who employed quantitative and qualitative methods to explore the use of AI tools by Indonesian students to improve their writing skills. The results indicated that students benefitted from AI tools primarily in the planning stage of conducting academic research, including identifying and developing research topics and drafting. Additionally, students perceived AI tools as flexible in accessibility although the tools may require further optimization of some features and the addition of others. In the same Indonesian context, Malik et al. (2023) explored students' perceptions of AI usage in academic essay writing. The analysis of the data collected through an online survey showed a positive reception of AI-powered writing tools among Indonesian students. The students particularly benefitted from the AI tools in grammar checks, plagiarism detection, language translation, and essay outlines. It was also found that AI-enhanced students' writing abilities, self-efficacy, and understanding of academic integrity. However, it must be noted that students expressed concerns about the potential impact of AI tools on creativity, critical thinking and ethical writing practices. In the same vein, Lee et al. (2024) used a mixed-methods approach to explore the perceptions of Korean university students. The results showed that students preferred to use AI tools in their writing classes due to their user-friendliness. The students found the tools particularly useful for enhancing vocabulary, providing translations, learning grammar, detecting and correcting errors. However, the students were somehow concerned that the tools sometimes provided inaccurate translations and unnatural expressions and grammatical structures.

The above survey highlights several gaps in the literature. First, further research is needed to uncover how university students perceive the use of AI tools to improve their writing proficiency, especially due to the ongoing fast development of these tools. Second, little focus has been placed on exploring how AI tools in general – not specific tools – are perceived by university students. This type of studies is highly needed to provide a more comprehensive picture of the use of these tools in writing classes. Third, more research is needed in the Saudi context because the Saudi society is rapidly embracing new technologies in line with the focus on digital transformation in its new Saudi Vision of 2030. To address these gaps, the current study disseminated a survey among Saudi students who were enrolled in academic writing classes as part of their university programs. The survey was designed to elicit students' perceptions toward the use of AI tools to improve the students' writing competence. The questions particularly addressed the types of tools that were

most frequently used, the components of the writing process in which these tools were most useful and the advantages and disadvantages of these tools in the students' perspectives.

RESEARCH METHOD

A mixed method research methodology was used to measure students' perspectives on the use of AI tools to support their academic writing in English. First of all, the researchers used the raw data to report exploratory factor analysis (EFA) results. Subsequently, they reported a descriptive analysis of students' perceptions in Saudi Arabia. The researchers aimed to answer the following research question:

- What are the perceptions of Saudi undergraduates regarding the use of AI tools to support their academic writing in English?

Participants

In order to investigate students' perspectives towards the use of AI tools, a survey was administered among 223 Saudi university students (140 males and 83 females) who were enrolled in academic writing courses as part of their educational programs at the freshmen level. Because it was important to ensure that all the respondents had already experienced the use of AI tools in improving their writing, the survey included a question about how long the respondents had used these AI tools. The researchers thus excluded 34 respondents from the original sample because these respondents reported that they had never used AI tools before. It is worth mentioning that the majority of students were using ChatGPT, Grammarly and Google Translate while some students were using Quillbot. The remaining tools were used by less than 10 participants for each tool.

The demographic data of the survey revealed that all the respondents were native speakers of Arabic and they spoke English as a foreign language. The students were highly proficient in the English language because they had already completed a preparatory year program in English to prepare them for their college studies. The students were also studying in English as a medium of instruction and were communicating with university professors from different language backgrounds using English. Hence, the researchers preferred to disseminate the survey in English to match the context of the students' studies and because the students' proficiency would allow them to easily understand the survey questions. The students, who ranged in age between 18 and 29 with a medium of 20.1, were enrolled in different university programs. The majority of valid respondents studied computer and information sciences (N = 79/42%) and social sciences (N = 76/40%) while the remaining number of participants were enrolled in engineering programs (N = 34/18%).

Instrument

The instrument (see **Appendix A**) consisted of three parts. The first part included demographic questions to classify the background information of the participants, including their gender, age and majors. The second part continued with 5-point Likert-type scale questions 'strongly disagree = 1; disagree = 2; neutral = 3; agree = 4; strongly agree = 5'. There were twenty-one items, that highlighted the students' use of AI tools in various stages of academic writing, including brainstorming, outlining, drafting and revising, and several requirements of the writing process, including choosing the appropriate style, the generation of citations and the identification/avoidance of plagiarism. A methodical technique was employed to create the survey instrument used in this investigation. Examining pertinent research on AI tools for academic writing was a necessary step in the development process (Almaraz-López et al., 2023; Barrett & Pack, 2023; Dempere et al., 2023; Irwin, 2024; Malik et al., 2023). The third part of the survey included two open-ended questions inquiring about the advantages and disadvantages of the use of AI tools to improve the writing of the respondents. It is important to note that the survey included two further questions in a multiple-choice format. One question inquired about how long the respondents had used AI tools to improve their academic writing, and based on this question we excluded the responses of 34 students who chose "never" as their response. Another question inquired about the AI tools the students had used for writing purposes. In this latter question, the students were required to check all the tools they had used and indicate other tools that were not mentioned in the list. The list included tools like Grammarly, ChatGPT, Quillbot, Google Translate, among others.

Validity and Reliability

Several actions were performed to guarantee the survey instrument's validity and reliability. Cronbach's alpha for the survey items was computed to assess reliability; the result was 0.88, indicating a good degree of internal consistency. This implies that the survey's items measure the same underlying construct in a reliable manner. Content validity was used to ensure validity. Experts in the field carefully examined the survey topics to make sure that all pertinent aspects of students' attitudes and opinions regarding AI tools in academic writing were sufficiently covered. The validity of the instrument was ensured by this procedure, which verified that the survey items were thorough, and representative of the constructs being measured.

Data Collection

Data were gathered from April to May in 2024 from a single Saudi Arabian institution. The survey was created using a Google form, and the department head for the academic writing classes was given access to the URL. The head of the department subsequently shared the link with the instructors of the academic writing courses who, in turn, shared the link with the students and asked them to complete the survey if they consented to. As per the requirements of the Institutional Review Board of the Saudi university, the participants reported their consent in the Google forms and the Google forms were kept anonymous. Additionally, the study data were stored confidentially with access only to the researchers.

Data Analysis

The data collected from the survey were analyzed using both quantitative and qualitative methods, with SPSS utilized for the quantitative analysis. In order to confirm the validity and reliability of the constructs, EFA was first used to pinpoint underlying elements in the survey results. After that, responses were compiled using descriptive statistics, which computed means and standard deviations to reveal patterns in the opinions of students regarding AI tools. In order to evaluate the survey items' reliability, Cronbach's alpha was calculated. Open-ended replies were subjected to thematic analysis, which developed themes by locating and coding important phrases. The results showed that while most students had a positive opinion of AI tools and acknowledged their potential to improve writing productivity and quality, they also voiced reservations about its dependability and potential ethical ramifications. Combining these techniques yielded a thorough comprehension of the experiences and viewpoints of the students, guiding suggestions for the morally and practically appropriate application of AI tools in academic writing.

FINDINGS

Exploratory Factor Analysis

The Kaiser-Meyer-Olkin (KMO) test was utilized by the researchers to assess the survey data's appropriateness for factor analysis. KMO, which has values ranging from 0 to 1, is an important criterion in assessing if factor analysis is appropriate (Ballesteros, 2003). According to Ballesteros (2003), the KMO test can evaluate the suitability of specific variables as well as the overall sufficiency of the sampling. According to Jolliffe's (2002) guidelines, a value of 0 suggests that the sum of partial correlations is substantial relative to the sum of correlations, indicating a diffuse correlation pattern and rendering factor analysis unsuitable. Conversely, a value close to 1 signifies compact correlation patterns, indicating distinct and reliable factors. Kaiser (1974) established that values above 0.5 are acceptable, with values between 0.5 and 0.7 considered mediocre, 0.7 to 0.8 good, 0.8 to 0.9 great, and above 0.9 superb (Anderson & Gerbing, 1984). In our study, the KMO value was .94, falling within the superb range, as highlighted in **Table 1**. Consequently, the researchers concluded that the data were suitable for factor analysis.

Table 1. KMO and Bartlett's test

Variable	Value
KMO measure of sampling adequacy	.940
Approximate Chi-square	2,399.304
df	210
Significance	.000

The researchers conducted an analysis on twenty-one items related to instructional support and the utilization of AI tools in academic writing through principal component analysis (PCA) with Varimax rotation (**Table 2**). PCA was chosen for its ability to streamline a large array of variables into a more concise set. The analysis yielded two distinct factors, collectively explaining 55.302% of the overall variance within the dataset. The first factor, designated as "instructional support of AI tools in academic writing," elucidated 50.027% of the variance, while the second factor, termed "instructional practices of AI tools in academic writing," accounted for 5.274% of the variance. Notably, these two factors were found to be independent of one another, exhibiting no correlation. Each factor provided unique insights into instructional support and practices regarding AI tools in academic writing.

Table 2. Pattern matrix

#	Items	Factor 1	Factor 2
1	AI-based tools can help me generate ideas for my academic writing.	.770	
2	AI-based tools can help me prepare good outlines for my academic writing.	.784	
4	AI-powered grammar and spell-check tools improve the quality of my academic writing.	.642	
5	AI feedback on writing style helps me revise and refine my academic writing effectively.	.665	
9	AI tools can help me improve the clarity of my academic writing.	.605	
11	Overall, AI technologies enhance my academic writing process.	.669	
12	AI tools help me save time during the academic writing process.	.605	
13	I find AI suggestions for improving my academic writing to be helpful.	.700	
14	AI enhances my ability to meet academic writing deadlines effectively.	.544	
15	AI tools assist me in organizing my ideas and arguments in academic writing.	.738	
20	AI tools offer valuable insights into improving structure and organization of my academic writing.	.572	
3	AI tools assist me in conducting research by gathering relevant sources for my academic writing.		.511
6	Using AI tools in the academic writing process increases my confidence in the final product.		.532
8	AI language translation tools facilitate cross-cultural communication in my academic writing.		.633
10	AI tools assist me in identifying and avoiding plagiarism in my academic writing.		.795
16	AI technology increases the efficiency of the proofreading process of my academic writing.		.647
17	I feel more motivated to produce academic writing when using AI tools.		.687
18	AI tools help me maintain consistency in formatting and citation styles in my academic writing.		.615
19	I trust AI-generated suggestions for improving the clarity of my academic writing.		.516
21	I feel more confident in my writing abilities when using AI assistance.		.534

The results of the EFA indicated that item 7 exhibited inadequate loading tendencies with respect to other latent variables. Consequently, this item was excluded from the scale. Communalities under the extraction assumption revealed the shared variance within the dataset's structure. The average communality for the study exceeded 0.5, with communalities post-extraction consistently surpassing 0.8. The cumulative average communality stood at 0.7 after aggregation.

Descriptive Analysis of Each Factor

Table 3 summarizes respondents' perceptions of AI tools in academic writing, showing strong agreement that AI aids in generating ideas (mean [M] = 4.40), preparing outlines (M = 4.27), and improving grammar and spelling (M = 4.45), with these tools seen as enhancing writing clarity (M = 4.21) and overall writing quality (M = 4.32). Respondents believe AI helps save time during the writing process (M = 4.28) and find AI-generated

Table 3. Instructional support of AI tools in academic writing

Items	N	M	SD
AI-based tools can help me generate ideas for my academic writing.	189	4.40	.796
AI-based tools can help me prepare good outlines for my academic writing.	189	4.27	.823
AI-powered grammar and spell-check tools improve the quality of my academic writing.	189	4.45	.761
AI feedback on writing style helps me revise and refine my academic writing effectively.	189	4.17	.901
AI tools can help me improve the clarity of my academic writing.	189	4.21	.862
Overall, AI technologies enhance my academic writing process.	189	4.32	.734
AI tools help me save time during the academic writing process.	189	4.28	.856
I find AI suggestions for improving my academic writing to be helpful.	189	4.26	.828
AI enhances my ability to meet academic writing deadlines effectively.	189	4.13	.948
AI tools assist me in organizing my ideas and arguments in academic writing.	189	4.17	.924
AI tools offer valuable insights into improving the structure and organization of my academic writing.	189	4.15	.905

suggestions to be helpful (M = 4.26). AI tools are also viewed as effective in helping meet academic writing deadlines (M = 4.13) and assist in organizing ideas and arguments (M = 4.17), providing valuable insights into improving the structure and organization of academic writing (M = 4.15). Despite the general consensus on the benefits of AI, indicated by consistently high means across all statements, there is noticeable variability in responses, with standard deviations ranging from 0.734 to 0.948. This variability suggests that while many respondents find AI tools beneficial, the extent of their perceived usefulness and impact can differ among individuals, reflecting a range of experiences and levels of agreement regarding the efficacy of AI in academic writing support.

Table 4 reflects respondents' perceptions of AI tools in academic writing, showing general agreement on their benefits. AI is seen as helpful in gathering relevant research sources (M = 4.03), boosting confidence in the final product (M = 3.97), facilitating cross-cultural communication through language translation tools (M = 4.00), and identifying and avoiding plagiarism (M = 3.89). Additionally, respondents believe that AI increases the efficiency of the proofreading process (M = 4.13) and helps maintain consistency in formatting and citation styles (M = 4.11). The use of AI tools also enhances motivation to produce academic writing (M = 3.97) and increases confidence in writing abilities (M = 4.06). Trust in AI-generated suggestions for improving the clarity of writing is moderate (M = 3.79). Despite these positive perceptions, the standard deviations, ranging from 0.881 to 1.200, indicate varying levels of agreement among respondents. This variability suggests that while many find AI tools beneficial in supporting different aspects of academic writing, individual experiences and levels of agreement with the effectiveness of AI tools differ significantly, reflecting diverse perspectives and personal preferences in their use of AI for academic writing tasks.

Table 4. Instructional practices of AI tools in academic writing

Items	N	M	SD
AI tools assist me in conducting research by gathering relevant sources for my academic writing.	189	4.03	1.015
Using AI tools in the academic writing process increases my confidence in the final product.	189	3.97	1.066
AI language translation tools facilitate cross-cultural communication in my academic writing.	189	4.00	1.042
AI tools assist me in identifying and avoiding plagiarism in my academic writing.	189	3.89	1.200
AI technology increases the efficiency of the proofreading process of my academic writing.	189	4.13	.890
I feel more motivated to produce academic writing when using AI tools.	189	3.97	.997
AI tools help me maintain consistency in formatting and citation styles in my academic writing.	189	4.11	.881
I trust AI-generated suggestions for improving the clarity of my academic writing.	189	3.79	1.025
I feel more confident in my writing abilities when using AI assistance.	189	4.06	.971

Responses to the Open-Ended Questions

In response to the question about the advantages of using AI tools to improve academic writing, most students agreed that AI tools were extremely beneficial in saving time, generating ideas, providing feedback and improving language accuracy, including spelling, grammar and vocabulary. Some students also preferred to use AI tools because they were helpful, easy to use and served as excellent assistants while conducting research. Additionally, a few students highlighted the usefulness of the tools in terms of building the writer's confidence and assisting with translation, formatting, generating citations and checking plagiarism. As for the disadvantages that the respondents shared, most students expressed their concerns about the over-reliance on these tools which could lead to the underdevelopment of important writing skills and result in plagiarism. Some students were also somehow dissatisfied with the tools because they could present inaccurate information and raise ethical concerns. Additionally, a few students expressed their dissatisfaction with the accessibility, cost and customization of these tools, and the need to post-edit and cross-check the content produced by these tools. It must be noted that 21% of the respondents reported no disadvantages for these tools.

DISCUSSION

The current study offers insightful information about how Saudi undergraduate students perceive using AI tools to assist with their academic writing in English. The majority of respondents reported favorable sentiments, which are consistent with the general tendency shown in earlier studies from a variety of

international contexts (e.g., Barrett & Pack, 2023; Kurniati & Fithriani, 2022; Song & Song, 2023). The participants in the present study emphasized the substantial advantages of AI tools in improving idea development, organization, syntax, and clarity, among other areas of their writing. These opinions suggest that AI tools are helpful in handling the intricacies of academic writing, which supports the results of related studies conducted in other nations (e.g., Bibi & Atta, 2024; Malik et al., 2023). The results also showed that AI programs like Grammarly, ChatGPT, and Google Translate are widely accepted. This acceptance reflects how adaptable and useful these tools are for handling many phases of the writing process, from ideation to editing. The students valued the AI tools' ability to save them time and help them write better overall, especially when it came to grammar and vocabulary – two important aspects of academic writing.

Students emphasized ChatGPT and other AI tools' usefulness for idea development and organization. They valued the ability to generate ideas, organize essays, and receive immediate feedback on their drafts with the aid of these tools. Numerous students reported that the use of AI tools made writing more productive and freed them from having to spend as much time on language mechanics as they would have liked. The idea of cognitive offloading – in which technology helps manage cognitive activities to free up mental resources for higher-order thinking – is supported by this element of the usefulness of AI technologies (Barrett & Pack, 2023).

In relation to the EFA, two components were identified in relation to the use of AI tools in academic writing by Saudi students: "instructional practices of AI tools in academic writing" and "instructional support of AI tools in academic writing." The high loading of items on these criteria indicates that students view AI tools as essential components of their instructional practices, boosting their enthusiasm and confidence in writing assignments, in addition to helpful assistance in content generation and organization. This dual use of AI tools emphasizes how they might revolutionize academic writing instruction by offering students ongoing, personalized guidance.

The survey also found that while most students had good opinions of AI tools, some were worried about the possibility of over-reliance on these technologies and the possibility of plagiarism. These worries align with the research conducted by Wang (2024) and Özçelik and Ekşi (2024) who observed comparable issues over striking a balance between utilizing AI tools and upholding academic integrity and individual learning growth. Teachers must confront the serious concern that students may lose valuable educational opportunities and critical writing abilities as a result of an excessive reliance on artificial intelligence. This emphasizes how crucial it is to help students become critical AI literate so that they can utilize AI technologies responsibly, maintain their writing voice, and acquire critical writing skills.

While many students found AI technologies valuable, there is variety in the perceived usefulness of these tools, as evidenced by the standard deviations in the descriptive analysis of the replies. This variety may be explained by individual differences in the way that students are accustomed to and skilled with AI tools, as well as disparities in the unique requirements and preferences of students in other academic fields. For example, compared to their classmates in the social sciences or engineering, students in the computer and information sciences may possess a more sophisticated understanding and feel more at ease while utilizing AI tools.

The quantitative findings are supplemented by the open-ended comments, which show that students like AI technologies for their ease of use and efficacy in improving language accuracy and sparking creative thought. But worries about errors, moral dilemmas, and customization requirements point to areas where AI technologies still need to be improved. These findings highlight the need for continual AI technology optimization in order to better serve students' varied needs and deliver more dependable, situationally relevant assistance.

This study emphasizes the need for explicit rules and training programs for the efficient and moral use of AI tools in academic writing, given the speed at which technology is advancing and the growing incorporation of AI in educational contexts. Teachers and educational institutions need to make sure that students have the ability to evaluate AI tools critically and use them correctly, striking a balance between using them and honing their own writing abilities.

In conclusion, the findings from this study contribute to the growing body of literature on the use of AI in education, providing specific insights into the Saudi context. Although the advantages of these technologies

are widely acknowledged, especially with regard to enhancing language accuracy and facilitating idea generation, serious doubts exist regarding their dependability, moral implications, and requirement for customization. These observations emphasize how crucial it is to use AI tools in academic writing in a balanced way that fosters a holistic learning environment by balancing the technology benefits with ethical and critical thinking issues.

CONCLUSION

Overall, by offering insights into the Saudi context, the study findings add to the expanding corpus of research on the application of AI in education. The results demonstrate different ways in which AI tools can improve academic writing, but they also draw attention to the obstacles and issues that must be resolved in order to fully reap the rewards of using them. The study thus offers a thorough assessment of Saudi undergraduate students' opinions regarding AI tools for academic writing, and it finds that these tools are typically well-received and have a noticeable favorable impact on writing efficiency and quality. But a balanced approach is required due to worries about over-reliance and the possible deterioration of critical writing abilities. AI tools have the potential to revolutionize academic writing education because of their dual role as essential teaching components and supportive assistance. The disparity in opinions points to the necessity for specialized assistance and training to optimize AI tools' advantages while minimizing their disadvantages. Future studies should carry out more investigation into these dynamics, especially in a range of educational settings, in order to establish the most effective and morally acceptable methods for incorporating AI into the teaching of academic writing.

REFERENCES

Almaraz-López, C., Almaraz-Menéndez, F., & López-Esteban, C. (2023). Comparative study of the attitudes and perceptions of university students in business administration and management and in education toward artificial intelligence. *Education Sciences, 13*(6), Article 609. https://doi.org/10.3390/educsci13060609

Anderson, J. C., & Gerbing, D. W. (1984). The effect of sampling error on convergence, improper solutions, and goodness-of-fit indices for maximum likelihood confirmatory factor analysis. *Psychometrika, 49*(2), 155–173. https://doi.org/10.1007/BF02294170

Ballesteros, R. F. (2003). *Encyclopedia of psychological assessment.* SAGE.

Barrett, A., & Pack, A. (2023). Not quite eye to AI: Student and teacher perspectives on the use of generative artificial intelligence in the writing process. *International Journal of Educational Technology in Higher Education, 20*(1), Article 59. https://doi.org/10.1186/s41239-023-00427-0

Bibi, Z., & Atta, A. (2024). The role of ChatGPT as an AI English writing assistant: A study of students' perceptions, experiences, and satisfaction level. *Annals of Human and Social Sciences, 5*(1), 433–443. https://doi.org/10.35484/ahss.2024(5-I)39

Chan, C. K. Y., & Hu, W. (2023). Students' voices on generative AI: Perceptions, benefits, and challenges in higher education. *International Journal of Educational Technology in Higher Education, 20*(1), Article 43. https://doi.org/10.1186/s41239-023-00411-8

Chauke, T. A., Mkhize, T. R., Methi, L., & Dlamini, N. (2024). Postgraduate students' perceptions on the benefits associated with artificial intelligence tools on academic success: In case of ChatGPT AI tool. *Journal of Curriculum Studies Research, 6*(1), 44–59. https://doi.org/10.46303/jcsr.2024.4

Dempere, J., Modugu, K., Hesham, A., & Ramasamy, L. K. (2023). The impact of ChatGPT on higher education. *Frontiers in Education, 8*, Article 1206936. https://doi.org/10.3389/feduc.2023.1206936

Dunn, M. (2021). The challenges of struggling writers: Strategies that can help. *Education Sciences, 11*(12), Article 795. https://doi.org/10.3390/educsci11120795

El-Dakhs, D. A. S., Ozfidan, B., & Ibrahim, N. G. (2023). Teachers' perceptions of digital language learning strategies: The case of a private Egyptian university. *International Journal of Online Pedagogy and Course Design, 13*(1), 1–18. https://doi.org/10.4018/IJOPCD.329967

Fayez, O., Ozfidan, B., & Ismail, H. (2023). The praxis of user experience (UX) in the design of undergraduate online classes: Framing the perceptions of engineering and social sciences students. *Sustainability, 15*(4), Article 3300. https://doi.org/10.3390/su15043300

Imran, M., & Almusharraf, N. (2023). Analyzing the role of ChatGPT as a writing assistant at higher education level: A systematic review of the literature. *Contemporary Educational Technology, 15*(4), Article ep464. https://doi.org/10.30935/cedtech/13605

Imran, M., & Almusharraf, N. (2024). Google Gemini as a next generation AI educational tool: A review of emerging educational technology. *Smart Learning Environments, 11*(1), Article 22. https://doi.org/10.1186/s40561-024-00310-z

Irwin, B. (2024). Exploring generative AI tools for English language learning: Student adoption and perceptions. *Sophia University Junior College Division Faculty Journal, 45*, 127–137.

Jolliffe, I. (2002). *Principal component analysis.* John Wiley & Sons.

Kaiser, H. F. (1974). An index of factorial simplicity. *Psychometrika, 39*(1), 31–36. https://doi.org/10.1007/BF02291575

Kurniati, E. Y., & Fithriani, R. (2022). Post-graduate students' perceptions of Quillbot utilization in English academic writing class. *Journal of English Language Teaching and Linguistics, 7*(3), 437–451. https://doi.org/10.21462/jeltl.v7i3.852

Lange, C., & Costley, J. (2020). Improving online video lectures: Learning challenges created by media. *International Journal of Educational Technology in Higher Education, 17*, 1–18. https://doi.org/10.1186/s41239-020-00190-6

Lee, Y. J., Davis, R. O., & Lee, S. O. (2024). University students' perceptions of artificial intelligence-based tools for English writing courses. *Online Journal of Communication and Media Technologies, 14*(1), Article e202412. https://doi.org/10.30935/ojcmt/14195

Lin, L. H., & Morrison, B. (2021). Challenges in academic writing: Perspectives of engineering faculty and L2 postgraduate research students. *English for Specific Purposes, 63*, 59–70. https://doi.org/10.1016/j.esp.2021.03.004

Malik, A. R., Pratiwi, Y., Andajani, K., Numertayasa, I. W., Suharti, S., & Darwis, A. (2023). Exploring artificial intelligence in academic essay: Higher education student's perspective. *International Journal of Educational Research Open, 5*, Article 100296. https://doi.org/10.1016/j.ijedro.2023.100296

Nazari, N., Shabbir, M. S., & Setiawan, R. (2021). Application of artificial intelligence powered digital writing assistant in higher education: Randomized controlled trial. *Heliyon, 7*(5), Article e07014. https://doi.org/10.1016/j.heliyon.2021.e07014

Nguyen, A., Hong, Y., Dang, B. & Huang, X. (2024). Human-AI collaboration patterns in AI-assisted academic writing. *Studies in Higher Education*, *49*(5), 847–864. https://doi.org/10.1080/03075079.2024.2323593

Nurmayanti, N., & Suryadi (2023). The effectiveness of using Quillbot in improving writing for students of English education study program. *Jurnal Teknologi Pandidikan, 8*(1), 32–40. https://doi.org/10.33394/jtp.v8i1.6392

Özçelik, N. P., & Ekşi, G. Y. (2024). Cultivating writing skills: The role of ChatGPT as a learning assistant—A case study. *Smart Learning Environments, 11*(1), Article 10. https://doi.org/10.1186/s40561-024-00296-8

Ozfidan, B., & El-Dakhs, D. A. S. (2023). Students' perceptions of online learning in non-L1 environments. *International Journal of Multilingualism*. https://doi.org/10.1080/14790718.2023.2239856

Song, C., & Song, Y. (2023). Enhancing academic writing skills and motivation: Assessing the efficacy of ChatGPT in AI-assisted language learning for EFL students. *Frontiers in Psychology, 14*, Article 1260843. https://doi.org/10.3389/fpsyg.2023.1260843

Syahnaz, M., & Fithriani, R. (2023). Utilizing artificial-intelligence-based paraphrasing tool in EFL writing class: A focus on Indonesian university students' perceptions. *Journal of English Language Teaching, 7*(2), 210–218. https://doi.org/10.30998/scope.v7i2.14882

Utami, S. P. T., & Winarni, R. (2023). Utilization of artificial intelligence technology in an academic writing class: How do Indonesian students perceive? *Contemporary Educational Technology, 15*(4), Article ep450. https://doi.org/10.30935/cedtech/13419

Wang, C. (2024). Exploring students' generative AI-assisted writing processes: Perceptions and experiences from native and nonnative English speakers. *Technology, Knowledge and Learning*. https://doi.org/10.1007/s10758-024-09744-3

Widianingtyas, N., Mukti, T. W. P., & Silalahi, R. M. P. (2023). ChatGPT in language education: Perceptions of teachers–A beneficial tool or potential threat? *Voices of English Language Education Society, 7*(2), 279–290. https://doi.org/10.29408/veles.v7i2.20326

Zimotti, G., Frances, C., & Whitaker, L. (2024). The future of language education: Teachers' perceptions about the surge of AI writing tools. *Technology in Language Teaching & Learning, 6*(2), 1–24. https://doi.org/10.29140/tltl.v6n1.1136

APPENDIX A: STUDY SURVEY

This survey aims to explore how Saudi undergraduates use AI tools (e.g., Grammarly, Turnitin, Google Translate, ChatGPT, Quillbot, Reverso, etc.) to support their academic writing in English as their second language. The survey consists of three parts: (1) consent form, (2) demographic information, and (3) the questionnaire.

Completing this survey is voluntary and you may withdraw at any time without giving reasons. The information collected will be treated with confidentiality and will only be used for research purposes.

(1) Consent Form

Please, read the following information and cross out as necessary:

I confirm that I have understood the purpose of this study.

☐ Yes   ☐ No

I understand that my participation in this study is voluntary and that I am free to withdraw from the study at any time and without having to give a reason.

☐ Yes   ☐ No

I understand that all data are anonymous and that there will not be any connection between the personal information provided and the data.

☐ Yes   ☐ No

I confirm that I have read and understood the above information and that I agree to participate in this research study.

☐ Yes   ☐ No

(2) Demographic Information

Gender:

☐ Male ☐ Female

Age:

Major (e.g., Architecture, Computer Science, etc.):

Native language (=mother tongue):

University:

Nationality:

Year of study:

☐ Preparatory Year Program (PYP)

☐ First year/Freshmen

☐ Second year/Sophomore

☐ Third year/Junior

☐ Fourth year/Senior

☐ Other:

How long have you been using AI writing tools for your academic writing?

☐ 1-3 weeks

☐ 4-7 weeks

☐ More than 7 weeks

☐ Never

What are the tools you have used? "Check all that apply."

☐ Chat GPT3,5/ ChatGPT4

☐ Grammarly

☐ Quillbot

☐ Reverso

☐ Turnitin

☐ Elicit

☐ Copy.ai

☐ Essay writer

☐ Peppertype.ai
☐ Jasper
☐ Google Translate
☐ Other
☐ None of the above

(3) The Study Questionnaire

Table A1. The study questionnaire

Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. AI-based tools can help me generate ideas for my academic writing.					
2. AI-based tools can help me prepare good outlines for my academic writing.					
3. AI tools assist me in conducting research by gathering relevant sources for my academic writing.					
4. AI-powered grammar and spell-check tools improve the quality of my academic writing.					
5. AI feedback on writing style helps me revise and refine my academic writing effectively.					
6. Using AI tools in the academic writing process increases my confidence in the final product.					
7. AI citation generators simplify the referencing process for my academic writing.					
8. AI language translation tools facilitate cross-cultural communication in my academic writing.					
9. AI tools can help me improve the clarity of my academic writing.					
10. AI tools assist me in identifying and avoiding plagiarism in my academic writing.					
11. Overall, AI technologies enhance my academic writing process.					
12. AI tools help me save time during the academic writing process.					
13. I find AI suggestions for improving my academic writing to be helpful.					
14. AI enhances my ability to meet academic writing deadlines effectively.					
15. AI tools assist me in organizing my ideas and arguments in academic writing.					
16. AI technology increases the efficiency of the proofreading process of my academic writing.					
17. I feel more motivated to produce academic writing when using AI tools.					
18. AI tools help me maintain consistency in formatting and citation styles in my academic writing.					
19. I trust AI-generated suggestions for improving the clarity of my academic writing.					
20. AI tools offer valuable insights into improving structure and organization of my academic writing.					
21. I feel more confident in my writing abilities when using AI assistance.					

22. What are the main advantages of using AI tools in academic writing for you?

23. What are the main disadvantages of using AI tools in academic writing for you?

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