

Generative artificial intelligence as powered writing tools in academic writing

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ABSTRACT

Generative artificial intelligence (GAI) as a writing tool is rampantly developing and attracting attention in academic writing. This study aimed to analyze the use of GAI as an AI-powered writing tool in academic writing among college students. By using a mixed method design with criterion purposive sampling, the researchers gathered the data from eighty students through a survey and selected individuals from all year levels underwent interviews. Descriptive statistics and thematic analysis were used to analyze their perceptions and integration of GAI tools. The result reveals mainly high levels of perception: knowledge perception, “high”; frequency and extent of use, “average”; impact on academic writing, “high”; and integration with human writers, “high”. The study further identified that the students integrate GAI writing tools to improve writing quality, efficiency, and productivity. On other hand, their disadvantages include over-reliance on GAI tools and inaccuracy issues. The findings suggest that GAI tools integration improves academic writing, but negatively impacts the students' character. This study stresses the importance of moderation in using GAI writing tools and recommends looking further into the different ways of effective integration.

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1. INTRODUCTION

Academic writing has gained more attention since introducing artificial intelligence (AI) approaches because of its tremendous potential. Generative artificial intelligence (GAI) techniques are seen as very beneficial to academic writing in various ways. These GAI systems have been evolving and making substantial progress in serving the various needs of their clients through specialized roles [1]. A few examples of these AI tools are Google Translate, ChatGPT, Grammarly QuillBot, Copy AI Technologies, and Peppertype Essay Writer. ChatGPT is capable of generating human-like responses, analyzing texts, summarizing, interpreting, conversing, computing, graphing, and many other complex processes involved in many areas besides language [2]. Google Translate is a valuable tool for translating texts from one language to another and even supports over a hundred languages [3]. Turnitin is another software for detecting plagiarism [4]. Turnitin has reduced the percentage of students' plagiarism. Grammarly is an AI-powered writing assistant tool that helps users craft their writing [5]. It is helpful in different types of writing. It has

functions like correcting, suggesting, and identifying inconsistencies. Quillbot is a convenient paraphrasing tool available on the market that uses state-of-the-art AI to paraphrase any content. The main goal is to rewrite text material by altering the structure of sentences and replacing words with synonyms while maintaining the meaning [6]. On a more positive note, AI writing tools such as Grammarly, QuillBot, Wordtune, and Jenni have been shown to significantly enhance students' writing skills. These tools employ advanced algorithms to detect common errors in grammar, punctuation, and syntax, while offering targeted suggestions to improve clarity, coherence, and stylistic quality. In addition, they provide specialized features, including paraphrasing and sentence refinement, which support more effective and polished written expression [7]. QuillBot, another AI-based tool, specializes in paraphrasing by enabling students to avoid plagiarism while preserving the original meaning of their content [8].

GAI can do a wide range of activities significantly more effectively than humans. GAI systems usually complete tasks quickly and with few errors, particularly regarding repetitious details. Another important application of AI in writing is its ability to expedite the literature review process, which deals with large volumes of partially structured (meta)data [9]. The impact of AI on education and its potential as a teaching tool, are still unknown [10]. Furthermore, ongoing research continues to examine the effects of AI writing tools on various dimensions of writing performance. For example, one study reported that AI writing tools such as AI Kaku, a widely used Japanese-developed English language learning application, may help reduce cognitive barriers among English as a foreign language (EFL) learners during the production of written English texts [11]. Neural networks, learner models, and algorithms offer helpful information that can guide choices about learning pathways, content selection, cognitive assistance, and student-centered discussion, among other areas of education [12].

Education in tertiary schools needs to understand GAI and its various functions, distinguishing between its supportive role and the potential for facilitating cheating. Even if AI has advanced significantly, human problem-solving, critical thinking, and questioning are still valuable. Educators must actively engage in scholarly conversations around GAI in higher education to influence future initiatives. In today's higher education environment, it is critical to acknowledge and address how GAI affects academic integrity [13]. Depending on one's viewpoint and interpretation, employing ChatGPT in academic work may or may not be considered plagiarism. ChatGPT and other GAI language models in scholarly work are continuously discussed within the educational community. Opinions on this subject may vary among researchers. Some contend that using ChatGPT without giving due credit and citation could be considered plagiarism. This perspective is predicated on the idea that the produced content needs to be recognized as a derivative source since it is not original [14]. Critics also contend that these GAI tools could cause students to plagiarize, cheat, submit entirely AI-generated writing, and completely supplant the craft of writing [15].

The usefulness and efficiency of this program in assisting students with their tasks is one reason why most students opt to utilize it. One of the advantages of using GAI writing tools when it comes to academic writing is that it can save time and improve efficiency. For instance, the natural processing algorithms can help writers identify and check the errors, enabling them to focus on their writing content rather than worrying about the writing mechanics [16]. When considering the advantages and disadvantages, students exhibit a more favorable disposition towards utilizing GAI than the disadvantages of these writing tools. Regarding interest and motivation, students are strongly inclined towards utilizing AI, as it becomes highly advantageous in completing their final project [17]. While GAI tools like ChatGPT enhance efficiency and accessibility, their use in writing remains stigmatized due to traditional notions of authorship and intellectual rigor. The article also argued against this stigma, advocating for a balanced perspective that values content quality over outdated ideals of textual purity [18]. It is believed that students who interact more actively with GAI-powered writing tools tend to perform better in writing tasks, as these tools are used as part of the writing process rather than merely as information sources. In contrast, students who rely on GAI in a limited or linear way often show weaker writing performance. Students also begin with different attitudes and levels of knowledge about GAI, but through continued and self-directed use, they develop greater awareness of ethical issues, improve their prompting strategies, and become more conscious of authorship and text ownership.

More importantly, the researchers believe that GAI technologies will continue to advance and transform academic writing. Generation zoomers (Gen Z), as digital natives, have grown accustomed to technology and have integrated it into their daily lives since birth. College students today are currently using GAI writing tools at a very high rate despite some disadvantages and negative opinions. As time has gone on, it has continued to draw more people, regardless of whether it is a shift or adaptation in institutional life. Thus, the researchers looked into the advancements made by this age in academic writing by posing the questions: i) what is the level of students' perception on the usage of GAI writing tools in terms of knowledge, frequency and extent of use, impact on academic writing, and integration of GAI with human writers? ii) what are the students' preferences in using GAI writing tools? and iii) what are the disadvantages of using GAI writing tools and how do the students address the problem?

2. METHOD

The study used a mixed-method approach to explore and describe GAI as a writing tool. The quantitative data was obtained through a survey on the students' perceptions of GAI writing tools in academic writing in terms of knowledge, frequency and extent of use, impact on academic writing, and integration of GAI with human writers. The qualitative data was obtained through semi-structured interviews on the students' knowledge, perceptions, and experiences with GAI writing tools.

A total of 80 English major college students participated in the survey as they regularly engaged in writing activities such as essays, research papers, reviews, and reports, making writing a central component of their academic experience. These students were also expected to demonstrate a high level of proficiency in English, encompassing an understanding of grammar, style, and syntax. Additionally, they belonged to Gen Z. Individuals born between 1997 and 2012 were the first generation of digital natives who grew up amid technological advancements and innovations. This made them an ideal group for the study as their familiarity with technology aligned with the focus of this research. 8 students were selected for the interview to answer semi-interviews. The students' familiarity on GAI writing tools was determined based on the given survey answered by the students. These respondents were specifically chosen for their familiarity with at least five GAI tools – Chat GPT, Quillbot, Grammarly, Turnitin, and Google Translate – providing a deeper insight into how GAI tools intersect with their writing practices.

An initial survey was administered to a larger sample of students to quantify their level of perceptions on the usage of GAI writing tools in terms of knowledge, frequency and extent of use, impact on academic writing, and integration of GAI with human writers. The participants were identified through their engagement with GAI writing tools for academic writing. Having confirmed their willingness in all the phases of the study by signing a consent form, the invitations were personally handed over providing the details about the purpose of study, the related processes, and the time and location of survey and interview.

The questionnaire and semi-structured interviews were adopted and modified from the research of Malik *et al.* [19]. Then, all were reviewed by competent authorities and underwent pilot testing and validity checks to ensure they were acceptable before the survey. The survey questionnaire was utilized to measure the level of students' perceptions of the usage of GAI writing tools. The quantitative data was organized using descriptive statistics. The qualitative data was analyzed through thematic analysis to identify observable themes and response patterns. Furthermore, an integrated analysis of qualitative and quantitative findings was conducted to discover a comprehensive view, leading to valuable conclusions for the study.

Prioritizing the respondents was essential in this study. The researchers ensured that all ethical standards of research were genuinely observed throughout the study. The researchers maintained ethical standards by ensuring informed consent, where participants were fully informed about the details of the study. The researchers also ensured confidentiality and privacy of the collected data which was exclusively used for the study and kept secured by the researchers. Additionally, honesty and integrity were upheld to demonstrate that there was no attempt to manipulate information but rather to analyze the use of GAI writing tools in academic writing.

3. RESULTS AND DISCUSSION

3.1. Level of students' perception on using generative artificial intelligence writing tools

Table 1 shows the students' level of perceptions on using GAI writing tools in terms of knowledge. Out of 80 respondents, 1 or 1.25% of the respondents is categorized as “very low”. While 38 or 47.5% of the respondents are categorized as “high”. This means that the majority of respondents have high level of knowledge on GAI writing tools, while several of the respondents have a very high level of knowledgeable on GAI writing tools. Additionally, the student's level of perception on the use of GAI writing tools in terms of knowledge has a weighted mean of 3.46 and is interpreted as “high”. The results imply that most students perceived themselves to be highly knowledgeable about GAI writing tools.

Syed and Al-Rawi [20] also found that most respondents had a favorable opinion of AI's application in the medical domain. In particular, half of pharmacy students agreed to understand it well. The students in this study demonstrated confidence in their comprehension of AI's capabilities, revealing that students from a wide range of academic fields have a high degree of understanding of AI's capabilities.

Table 2 shows the students' perception of using GAI writing tools in terms of frequency and extent. Out of 80 respondents, only 2 or 2.5% are categorized as “very low”. This means that a few respondents have very low engagement with GAI writing tools. And 38 or 47.5% are categorized as “high”. Moreover, the student's perception of using GAI writing tools in terms of frequency and extent of use has a weighted mean of 3.33 and is interpreted as “average”. Thus, this implies that the students perceived themselves to have average engagement with GAI writing tools.

Table 1. Students' level of perception on usage of GAI writing tools in terms knowledge

Interval	Descriptive interpretation	Frequency	% of total
1.00-1.79	Very low	1	1.25
1.80-2.59	Low	7	8.75
2.60-3.39	Average	25	31.25
3.40-4.19	High	38	47.5
4.20-5.00	Very high	9	11.25
	Total	80	100
	Mean		3.46
	Remark		High

Table 2. Students' level of perception on usage of GAI writing tools in terms frequency and extent use

Interval	Descriptive interpretation	Frequency	% of total
1.00-1.79	Very low	2	2.5
1.80-2.59	Low	9	11.25
2.60-3.39	Average	25	31.25
3.40-4.19	High	38	47.5
4.20-5.00	Very high	6	7.5
	Total	80	100
	Mean		3.33
	Remark		High

This result is consistent with Al-Bukhrani *et al.* [21] claims that attitudes and subjective norms had a beneficial impact on academic researchers' intent to embrace AI tools, indicating that social influence and individual perceptions are essential factors in determining the frequency and scope of use. Similarly, they noted that social impact and positive views regulate students' use of AI writing tools, resulting in an average level of usage. Interestingly, neither study found that perceived barriers to utilizing AI technologies significantly impacted adoption intentions. Although some students may be wary of GAI, general usage frequency is still moderate. Similar to the findings in the context of academic researchers, these show that although students are generally receptive to employing GAI technologies, their levels of involvement are still growing, resulting in an average overall use.

Table 3 highlights the students' perceptions of GAI writing tools regarding their impact on academic writing. The majority, 34 students, or 42.5%, fall under the "high" category, while 15 students, or 18.75% are categorized as having a "very high" perception. Additionally, 29 students, or 36.25% have an "average" perception of the impact of GAI on academic writing. Notably, no students (0%) fall under the "low" category, while 2 students, or 2.5% are classified as having a "very low" perception. Overall, the statistical analysis indicates that the weighted mean of the students' perceptions is 3.58 which is interpreted as being in the "high" category. The results show that the students have a high level of use of GAI writing tools regarding their impact on improving their academic writing, which means that most of the respondents believe these tools significantly affect their academic writing. The findings highlight that GAI writing tools improve content organization, grammar, and writing efficiency. These results emphasize the importance of GAI writing tools in aiding students with idea generalization, thought organization, and language refinement. Most respondents believe that GAI writing tools are essential to their writing tasks. These tools help them to complete their assignments more efficiently and improve their writing process. Additionally, students find that GAI writing tools assist with generating ideas, organizing thoughts, and even refining their language, making their academic tasks more manageable and efficient. Steiss *et al.* [22] stated that AI writing assistants significantly enhance students' writing process by helping them with content organization, grammar, and providing suggestions.

Table 4 shows the students' level of perception of using GAI writing tools in terms of integrating GAI with human writers. Out of 80 respondents, there is only 1 or 1.25% which is interpreted that the student had a very low level of integration of GAI with human writers. 37 or 46.25% is interpreted as "high". Therefore, the statistical analysis indicates that the weighted mean of the students' perceptions is 3.65 which is interpreted under "high" category. This suggests that these English major students generally perceive their level of perception of the usage of GAI writing tools in terms of integrating GAI with human writers is high. Sumakul *et al.* [23] also claimed that AI could help students understand theoretical concepts, assist them during the writing process, and help them learn grammar and vocabulary. With these positive perceptions, this study suggests that AI technology could benefit students.

Table 3. Students' level of perception on usage GAI writing tools in terms impact on academic writing

Interval	Descriptive interpretation	Frequency	% of total
1.00-1.79	Very low	2	2.5
1.80-2.59	Low	0	0
2.60-3.39	Average	29	36.25
3.40-4.19	High	34	42.5
4.20-5.00	Very high	15	18.75
	Total	80	100
	Mean		3.58
	Remark		High

Table 4. Students' level of perception on usage GAI writing tools in terms integration GAI with human writers

Interval	Descriptive interpretation	Frequency	% of total
1.00-1.79	Very low	1	1.25
1.80-2.59	Low	2	2.5
2.60-3.39	Average	22	27.5
3.40-4.19	High	37	46.25
4.20-5.00	Very high	18	22.5
	Total	80	100
	Mean		3.65
	Remark		High

3.2. Students' preferences for using GAI writing tools

3.2.1. Improved writing quality

This theme demonstrates how students perceive GAI writing tools as aids to enhance their writing by improving grammar, mechanics, clarity, organization, and style. These tools detect grammatical errors, suggest sentence structure improvements, and provide punctuation guidance. They also simplify complex vocabulary, recommend transitional phrases, and analyze coherence. Additionally, GAI writing tools assist with citation management, plagiarism detection, and instant feedback. Features like text-to-speech, speech-to-text, and multilingual support facilitate accessibility. Effective integration involves using GAI writing tools to supplement human instruction, teaching critical evaluation of suggestions, and encouraging revision and editing. Thus, this theme focuses on enhancing key aspects of writing, including grammar and mechanics, clarity and conciseness, organization and coherence, style and voice, and content accuracy. As responded by the participants:

My ideas increased, and the construct improved. (Student 1)

Before I discovered GAI, there were a lot of red marks in my work because of grammatical errors. When I used Grammarly, the errors were lessened until now that I am already in college. When it comes to my writing style, I make many incorrect or grammatical errors. However, when I used Grammarly, I learned how the grammar works. So, this is how it works! It really improved my writing style. (Student 2)

Yes, my knowledge about GAI has widened. For example, when you search, it feels like you're learning some new words. It helps expand your vocabulary about it, that this is the meaning of certain words you searched. When I used GAI, I learned a lot. It enhanced my vocabulary, punctuation, and grammar skills. (Student 5)

It has really improved because GAI provides grammatical structures and helps with sentence construction. I would say it's 99.9% error-free. (Student 8)

These responses synchronously depict that respondents have considered using GAI as a helping tool to improve their academic writing. They perceived that the use of GAI tools was efficient in correcting grammar structure and enhancing vocabulary. Zulfa *et al.* [24] claimed that the AI tools were able to help improve the students' academic writing by providing them with direct feedback and corrections. Additionally, it was implied that incorporating technology tools in English academic writing has the potential to revolutionize the development and evaluation of writing skills. It was also essential for the students to balance using the preferred AI writing tools and honing their writing skills to ensure writing development.

3.2.2. Efficiency and productivity

GAI tools were also considered by the students as tool to enhance their academic writing efficiency and productivity by automatic formatting, citation management, and grammar checking, saving time on manual proofreading. They are also perceived to assist with research, generating outlines, suggesting relevant sources, and providing content ideas. GAI writing tools offer content generation, sentence restructuring, and vocabulary suggestions. Additionally, features like text-to-speech, speech-to-text, and multilingual support facilitate writing. Tools like Grammarly, ChatGPT, and Hemingway Editor provide focus-enhancing environments, writing analytics, and collaboration capabilities, enabling writers to work more efficiently and effectively.

I was influenced by others. I like using Grammarly because of its effectiveness. Since I started using Grammarly, I no longer mind the grammar. For example, when I paste my work and Grammarly corrects it, I don't get conscious about the grammar whether it is right or wrong as I read through because it provides accurate corrections. (Student 2)

I discovered that website this year, but I am already a user of Grammarly and Quilbot since before. ChatGPT is a new way for me to support my knowledge since the library is not accessible to me. That's why I tend to rely on ChatGPT. (Student 4)

These responses indicate that students perceived GAI tools usage as a helpful tool that resulted in their efficiency and productivity in academic writing. This interpretation aligned with the study in [25] highlighted the wide range of emerging tools and techniques that are redefining academic writing assistance, and it concluded that the use of AI writing tools in academic writing represents a transformative shift in how students and researchers approach the writing process. Furthermore, a wide range of features, including advanced features like content generation, citation management, plagiarism detection, and grammar and style

correction, are available through AI writing tools. These tools improve the quality and efficiency of writing and democratize access to writing assistance, making it more widely available. Moreover, the students valued the AI writing tools' ability to save them time and help them write better, especially regarding grammar and vocabulary which are the two essential aspects of academic writing [26].

3.3. Disadvantages of using generative artificial intelligence writing tools

3.3.1. Over-reliance

This theme suggests that there are tendencies where the participants develop a dependence on GAI writing tools. This dependence spawns from the users' necessity and tendency to use GAI writing tools, which may develop into a routine later. Thus, this theme came about as one of the disadvantages in academic writing due to the significant influence of GAI writing tools on inducing over-reliance among users.

So far, using GAI has its disadvantages like relying on it. You don't put in effort. For example, I will paste my work, then Grammarly corrects it. You don't have to review it. You just copy it. (Student 2)

Its disadvantage is the over-reliance on the website. (Student 4)

Its only downside is that we become too reliant on it. (Student 6)

The responses reveal the students are concerned about using GAI writing tools because of over-reliance. It means the users have become dependent on it to accomplish their writing tasks. Most of the respondents have a negative impression and see it as a disadvantage. They also believe that it may develop further issues concerning ethical use. This means that the respondents see it as one of the major concerns in using GAI writing tools as it hinders and compromises their development. Robbins [27] stated that the downside of dependence on AI is that users lose their skills from not utilizing it and the lack of necessity. Jie and Kamrozzaman [28] also mentioned similar challenges among the students at the International University in Kelana Jaya, Petaling Jaya, Selangor which gave them a high level of dependency on AI tools and decreased critical thinking skills. Therefore, this means that the issue of over-reliance on AI tools is an issue that all AI tool users may confront.

3.3.2. Inaccuracy

In this theme, GAI writing tools are seen by the students as having a tendency to input incorrect information. This can be due to the GAI's system limitation. Although it is a common occurrence, some of it is challenging to spot because it requires understanding and keen eyes. Having caused confusion among users due to incorrect information, the respondents perceived it as a disadvantage when using GAI writing tools.

Even though it is the GAI that crafted it, there is that... Oh, this is wrong! (Student 7)

There are errors that we have to filter out. (Student 8)

The responses indicate that there are instances in which GAI writing tools provide information that may not be true to the subject matter and is rendered inaccurate. A respondent made an expressive statement upon recognizing an error suggesting an unexpected occurrence. This may imply the difficulty in spotting the error or a dissatisfaction toward the GAI-generated texts which expresses a significant concern among the respondents due to its negative impact on their output. GAI writing tool ChatGPT can be biased or inaccurate depending on the data it is trained which may be flawed. This means that the information it based its answer on is the reason for the error in its response [29]. There are also identified multiple distorted information from ChatGPT using a literature review [30]. This reveals that some AI writing tools are undeniably subjected to inaccuracy.

3.4. Addressing the disadvantages of using generative artificial intelligence writing tools

3.4.1. Encourage self-improvement

The theme demonstrates how students believe consistent personal effort and practice are essential for their skill development and learning. As mentioned by the participants they actively construct their work instead of entirely relying on GAI writing tools, they also talked about reviewing their job to ensure its quality, they want to improve their writing skills rather than using GAI to replace them. They also emphasized using GAI writing tools only as guide to encourage self-improvement. These actions reflect their belief that practicing and putting in effort leads to better understanding and long-term growth. In their responses:

I will improve by not relying on GAI all the time. I will try writing essays using my ideas or completing assignments without depending on GAI. (Student 1)

As a GAI user, I also make myself aware if I am relying too much on ChatGPT. If it becomes excessive, I should rely on my skills and not depend too much on GAI. It is effective because I can also learn. (Student 4)

This theme exists because students value their ability to improve through hard work and practice. They know that while GAI can assist, they are learning from their attempts and revisions. By prioritizing personal effort, they aim to become more confident and capable in their academic and creative pursuits. They believe that while GAI writing tools can help, it's still crucial to their ideas and creativity. They want to personalize their work and ensure that it reflects their thoughts, so they need to ensure that GAI's input is mixed with their efforts.

3.4.2. Double-check the generative artificial intelligence outputs

The themes highlight that participants understand GAI is not perfect and sometimes makes mistakes. To avoid problems, they review GAI-generated outputs or compare them with other sources to ensure accuracy. They recognize that GAI writing tools, while helpful, are not always accurate information. They understand that relying too much on GAI writing without verifying its output can lead to mistakes in their work. By reviewing and double-checking the GAI-generated content with other sources or their own, they aim to ensure accuracy and maintain quality in their tasks. This cautious approach likely stems from personal experiences with GAI errors or from guidance they've received about the importance of critical thinking when using technology. Some of the participants said:

For example, if I'm unsatisfied with ChatGPT's answer, I'll search for information on other websites. (Student 7)

Yes. Directly use another GAI if he provides the same information as the software provided or you do manual searching if your searches coincide with the GAI. (Student 8)

These themes emphasize that students understand that GAI writing tools, while helpful, are not always accurate and can make mistakes. This understanding likely comes from personal experiences where GAI provided incorrect information or guidance, they've received emphasizing critical thinking when using technology. By double-checking GAI outputs, students aim to ensure that their work is accurate and high-quality, avoiding potential errors from unquestioningly trusting GAI writing tools. People often approach GAI with caution because they know it's not perfect. They understand that GAI tools can sometimes provide incorrect or biased information. As a result, many users need to verify GAI-generated content with other reliable sources to maintain accuracy and trust in their work. This careful approach helps them use GAI writing tools effectively while minimizing risks [31].

3.4.3. Encourage independent work

This theme emphasizes how certain situations that faced the respondents in using GAI writing tools may be inspired to work independently by specific difficulties when utilizing GAI writing tools. It suggests there are advantages to requiring students to do their tasks independently since it fosters their abilities, originality, and academic writing. Few of the responses include as follows.

If there's no internet connection and poor signal. It is nice because it will force you to do it independently without relying on GAI. (Student 3)

The ability of a human to craft a piece and formulate thoughts will not be practiced or enhanced. I fear being found out that I am using GAI. It might even reach the point where I can no longer construct a paragraph on my own. I'm scared that I might no longer know how to write with proper grammar. That's why I am practicing myself by writing a journal. (Student 6)

The difficulties participants encountered when depending on GAI technologies gave rise to themes promoting independent work. Lack of internet, steady connection, or enough data is the central issue that the participants brought up. Because of this, they are forced to rely on their abilities and knowledge to finish their tasks. While students feel that they should cultivate their own critical thinking skills, these participants acknowledge that GAI assistants can offer helpful information and ideas but students believe that they should develop their critical thinking, writing skills, and creativity. The themes encouraging independent work arise from challenges faced by the participants when relying on GAI tools in their writing tasks. Padilla *et al.* [32] suggested that using GAI writing tools in academic writing might prevent students from honing their writing

and critical thinking skills. Balancing the use of GAI writing tools and independent work to promote better academic development and to ensure that students keep improving their writing skills.

3.4.4. Set boundaries on generative artificial intelligence usage

Students understand that relying on GAI writing tools for every task may lead to a lack of discipline and skill development. By defining specific situations where GAI writing tools are appropriate and acceptable for use such as for time-intensive projects or generating ideas they maintain a balance. These boundaries help them stay in control of their work and ensure they still put in personal effort where it's needed. Participants advised that students can use GAI for their academic writing but they need to set boundaries for using it, as they responded.

Using GAI is fine as long as you know how to use it properly. Everything has limitations; you shouldn't always rely on GAI for your work. You still need to reduce your use of GAI. (Student 2)

No, because what's the purpose of studying if you rely solely on GAI? GAI should be used to find references or explanations but not as your primary source. Don't copy and paste everything because teachers use GAI detectors. It's okay to use GAI if you want to learn something or need more detailed explanations, but only when necessary. Just take the main points and don't copy everything word for word. (Student 5)

Ouyang *et al.* [33] emphasized clear boundaries that allow AI to complement education without replacing key aspects like originality and problem-solving. For these students, setting limits means staying disciplined, preventing misuse, and ensuring their growth as learners remains priority. Participants suggested that students may use AI for academic writing, but clear limits should be established on how it is used.

4. CONCLUSION

Based on the study's findings, GAI writing tools were self-reported by the students to be beneficial in leveraging tools in academic writing to improve quality, efficiency, and productivity. Despite the benefits, disadvantages are present and were reported by the students. These downsides include over-reliance and inaccuracy. However, it did not hinder the students from taking advantage of this opportunity to advance the quality of academic writing. Thus, they have developed countermeasures such as encouraging self-improvement, double-checking the GAI outputs, encouraging independent work, and setting boundaries on GAI usage to ensure the stability of their development. The study recommends for further exploration and analysis of GAI writing tools in enhancing technological literacy and how they are beneficial for effective integration into the academic setting.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state that they have no recognized financial conflicts of interest or personal connections that might have seemed to affect the findings presented in this paper.

DATA AVAILABILITY

The information that underpins the results of this research can be obtained by contacting the corresponding author, [EBG]. This data includes details that may jeopardize the confidentiality of the research subjects, and therefore, it is not accessible to the public due to specific limitations




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