UNDERSTANDING THE IMPACTS OF IMPLEMENTING AI WRITING DIGITAL TOOLS ON UNDERGRADUATE STUDENTS' ACADEMIC WRITING SKILLS

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ABSTRACT

The use of Artificial Intelligence (AI) writing tools within higher education has become increasingly popular in terms of developing the quality of undergraduate students' academic writing skills. This paper explores the effects of AI writing digital tools (e.g., Grammarly, ChatGPT, and Quillbot) on students' performance in writing through a mixed-methods approach with 370 undergraduate-level surveys and semi-structured interviews. The results suggest that ease of use of the tool significantly predicts better writing skills and the need to make tools easy-to-use so as to promote engagement, while quality of feedback, writing anxiety and frequency of use are not statistically significant but rather optimistic for students. Qualitative results also confirmed that AI-tools supported immediate, non-judgmental feedback and less stress but higher confidence in writing, especially at the start of the task; however, questions were raised about generic outputs, fact-checking, lack of collaboration as well as ethical concerns around authorship. These findings have implications for writing education, as AI can help with superficial issues such as grammar, clarity, and surface fluency in writing, without reflective engagement and pedagogical mediation, the value of AI to develop deeper thinking (certainly critical thinking) and a developed argument is limited. The study indicates that AI tools require a balance with clear instructions, techniques and an ethical framework to utilize the effectiveness of AI tools in education and maintain academic integrity.

Keywords: artificial intelligence, academic writing, writing digital tools, higher education, technology integration

Subject Area: LA173-186 Higher Education

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AI	Artificial Intelligence

CHAPTER 1

INTRODUCTION

1.1 Overview

The integration of artificial intelligence (AI) writing tools in higher education has garnered considerable interest because of its potential to improve academic writing abilities. As university students grapple with complex writing tasks, these tools offer support in areas such as grammar correction, content organization, and style refinement (Mijwil et al., 2023). However, the impact of such tools on students' overall writing proficiency, critical thinking, and autonomy remains a topic of debate. This chapter explores how academic writing skills are shaped by AI writing tools, outlining the background of the study, research problems, objectives, significance, and scope to provide readers an in-depth understanding of this emerging trend.

1.2 Background of the Study

Academic writing is a fundamental skill for university students, serving as a cornerstone for intellectual development, critical thinking, and effective communication. The ability to produce coherent, well-structured, and analytically sound writing is essential not only for academic success but also for future professional endeavors. However, academic writing poses a challenge to many students as it requires the use of appropriate language, following specific requirements for a certain academic field, and expression of a unique idea (Vicatos, 2021). This is normally accompanied by poor mastery of English, inadequate feedback, and stress that comes with high stakes academic tests. As a result, enhancing academic writing has emerged as one of the most important concerns for both, educators and educational organizations. In the recent past, the application of artificial intelligence (AI) in education has unveiled new avenues to combating these challenges. Grammarly, ChatGPT, and Turnitin's Revision Assistant are examples of AI writing tools that

allow for continuous feedback on the grammatical choices, syntax, style, and even the logical connectivity of the written content. These tools are intended to help students remove mistakes and find better options for their words, phrases, and overall sentences. Another part of the virtual learning environment is to include tools that will help catch plagiarism and make students stick to the academic honor codes. Such advancements are also likely to expand the access to quality writing assistance to more people especially in cases where classical approaches to writing assistance, such as one on one tutoring, are scarce or unaffordable.

Applying AI writing tools in academic environment is in alignment with other changes that have happened in educational technology and learning-teaching practices. In the past, writing assistance was mainly provided by human tutors and feedback from peers (Dwivedi et al., 2023). However, as students come in different levels of writing prowess and different linguistic abilities, conventional feedback processes cannot address particular needs of numerous students at the same time. The application of AI tools makes it possible to create a system that can give feedback in real time thus providing relief to instructors and improving the learning experience of students. This transfer is consistent with today's educational objectives concerning individual learning, computer competencies, and endless training. However, how such AI writing tools affect student writing remains a focus of emerging concern even as more students adopt the tools for their assignments. These tools help in the improvement of students' learning since the students are instantly given feedback for their assessment and more professionally they mark the errors that we do in our works (Ejjami, 2024). They are of the opinion that AI can enable students increase confidence in their writing, decrease their level of anxiety and foster a more recursive approach towards the writing process. In the same way, AI helps show students different possible range of words and styles, thus enhancing students' language repertoire and creativity.

However, critics caution that reliance on AI writing tools may undermine critical aspects of the learning process. There are concerns that students may become overly dependent on these tools, potentially hindering the development of their own analytical and writing skills. Moreover, it has been argued by some scholars that AI feedback is less capable at understanding context and engagement structures as its sources, implying that the kind of enhancement it offers the students may be surface level, as opposed to a deep level that would help improve the skill. Another ethical concern is the possibility that the use of AI tools may lead to encouragement of plagiarism or a decline in students' attitudes to academic integrity since writing assignments will be automated (Johnson, 2023). Another area of concern when incorporating AI in the teaching of writing is equity and access. On one hand, AI tools can alleviate disadvantage caused by different linguistic and education experience of students and, on the other hand, the issue of equitable distribution of technology makes the situation worse. Besides, the algorithms which AI tools rely upon down to are usually patterns which have been obtained from the English language primarily and therefore it raises issues of biased and irrelevant feedback. Such challenges indicate a need for a critical approach to AI technologies principles and applications in educational settings irrespective of an environment that promotes effective and responsible integration of the technologies to advance learning.

As applied to education, specifically, college and university education, knowledge on how AI writing tools affect academic writing performance is important in creating appropriate instructional and learning approaches. University leaders have to manage tension between employing new technologies as tools for learning and maintaining the conventions of learning goals. With the expansion of utilizing AI in different spheres of the academic environment, it has become the challenge for educators and policymaker to assess the efficiency, benefits, drawbacks and widely

accepted practices of application of these tools in learning process (Shah, 2023). This paper aims at adding to this discussion by investigating the effects of AI writing instruments on university student's academic writing proficiency. The purpose of this study is to better understand how AI writing tools might be used to their pedagogical applications by analyzing factors like usability, feedback, writing stress, and usage frequency. It will also show whether such tools lead to ownership of the targeted skills or are mere shallow remedies concealing lack of writing aptitude. These findings are expected to help educators, instructional designers, and policymakers on how best to enhance the use of AI in writing education to improve the students learning outcomes besides facing the challenges and ethical issues.

1.3 Problem Statement

Academic writing remains a significant challenge for university students worldwide, especially in an era where higher education increasingly demands rigorous writing standards. The lack of compliance with requirements and exhausting expectations is quite comprehensible because academic writing implies comprehending rather diverse concepts, creating texts that satisfy formal demands, and providing clear and well-organized presentations of the arguments and supporting materials (Rauf, 2021). For the students with limited English, with no access to feedback or one-on-one consultations, or those who get anxious when writing, this tends to be even more difficult. Many conventional approaches to writing guidance and feedback including meetings with the tutor or having comments from the instructors, are often ineffective to address the needs of students in a prompt and comprehensive manner. Consequently, learners may feel frustrated, develop less confidence, and underachievement may become rampant. AI writing tools present a possible solution to these challenges because they work as writing assistants that help out in real time with issues such as grammar, style, coherence and even the uniqueness of the content. The three most

common tools used by students at the moment are Grammarly, ChatGPT, and Quillbot, which enhance the flow, accuracy and confidence in writing (Raheem et al., 2023). However, the increased use of these tools poses some fundamental questions as to the kind of effect these tools have on students' writing skills. However, Instant Writing Assistants potentially can also create new problem, which is over dependence of using the AI for writing rather than engaging in writing correcting process. This gives rise to the concern as to whether these tools actually improve the students' writing skills as well as standards or simply provide cosmetic improvements that hide technology imperfections.

Furthermore, AI tool efficacy in supporting sustainable skill progression has not yet been investigated adequately. As the available tools are currently being discussed, scanty empirical evidence is available on whether these tools assist learners to develop critical thinking, argumentation, and analytical skills, which are critical components of academic writing. While using AI tools as feedback for writing proofs and assignments will enhance the mechanical quality of the writing including compliance with rules of grammar, it is doubtful whether these technologies can help in doing deep analysis of the writing content with the goal of ascertaining or enhancing the logical flow, coherence and ability to generate new ideas (Seo, 2024). This raises an important pedagogical question: is it effective for students to write better or are they just learning how to use technology to re-write their work? The use of AI tools introduces yet another threat by undermining the students' confidence in their writing by adding to their writing stress produced by other factors. Math anxiety is a prevalent phenomenon amongst university students because of fear of being judged, language barriers or previous unpleasant writings experiences. AI writing aids may help do this to some extent because users can write without fear of criticism since they can see that the program is only there to help them improve their writing in further iterations

(Rasouli et al., 2024). However, it remains ambiguous whether this reduction in anxiety leads to improvements in writing competencies or generates dependency that limits students' writing abilities without help. Also, concerning the effectiveness of using AI tools, the amount and quality of the feedback differ and so does the impact on the students. It is for this reason that while some of the students can use the available tools occasionally, others are more dependent on them and this make the result of writing to be blurry. Moreover, with many AI tools currently on the market, their feedback may not be contextually relevant, or may not meet the standards set by different academic disciplines altogether.

1.4 Research Objectives

1. To evaluate the relationship between the ease of use of AI writing tools and improvements in students' academic writing skills.
2. To examine how the quality of feedback provided by AI tools affects the development of students' academic writing.
3. To investigate the extent to which AI tools reduce writing anxiety and its impact on students' writing performance.
4. To analyze the influence of the frequency of AI writing tool usage on the enhancement of academic writing skills among undergraduate students.

1.5 Research Questions

1. What is the relationship between the ease of use of AI writing tools and improvements in academic writing skills of students?
2. How does the quality of feedback provided by AI tools affect the development of students' academic writing?

3. What is the extent to which AI tools reduce writing anxiety and its impact on students' writing performance?
4. What is the influence of the frequency of AI writing tool usage on the enhancement of academic writing skills among undergraduate students?

1.6 Significance of the Study

The integration of AI writing tools into higher education represents a pivotal shift in how academic writing is taught, practiced, and evaluated. The study is important because it fills a vital research niche, which is assessing the usefulness of AI technologies in improving the quality of writing by university students (Khalifa and Albadawy 2024). Therefore, by identifying how these tools affect grammar, structure, coherence, and the critical thinking skills, the research will help to determine whether these tools make students learn effectively or merely provide gimmicks. This understanding is useful for teachers who would like to integrate technology in teaching and learning processes in an effort to improve outcomes as well as prepare students with core sets necessary for learning.

From the student's perspective, the study is noteworthy as tries to understand if AI applications can help alleviate writing stress and increase students' self-perceived writing skills. Stress and apprehension are familiar to many students when writing academic papers, and learning how AI can help will provide value (Rane et al., 2024). This is especially so if such tools are found to help students not only in error detection but in better comprehending the writing process, thus enabling them to have better learning experiences and therefore improved performance. From a knowledge creation standpoint, it advances the understanding of teaching and learning processes, contributing to instruction and curriculum learning design. It would be useful for institutions providing tertiary education and instructors to adopt such information in formulating rules on how best to implement

AI writing tools in teaching writing, without eliminating traditional forms of instruction. Furthermore, the study will address the possible moral issues arising from AI tool application. It will enhance the ongoing debate on the integration of responsible AI in education. This research may contribute to the refinement of the guidelines concerning AI-supported writing tools to serve the objective of helping students and educators to develop into meaningful, effective learning systems that respect academic integrity.

1.7 Scope of the Study

This study focuses on understanding the impact of AI writing tools on university-level students' academic writing skills. It discusses issues like the relevance of ease of use, quality of feedback given, students' writing apprehension, and the frequency of tool use to identify the impact on students writing ability. The subjects of the study are university students who perform academic writing tasks on a daily basis, including essays, research papers, and reports, among others The goal is to identify how AI influences different aspects of writing, like the grammar, coherence, vocabulary, and critical thinking. This research is done within the context of higher learning institutions where students have access to AI tools whether through their school's subscription or through their personal means. The research design collects data from questionnaires and interviews to obtain quantitative and qualitative data to examine the students' situations and final results. Also, the role of instructors and how feedback from them interplays with AI feedback is also taken into account (Parker et al., 2024). It solely includes university students, excludes primary or secondary education levels, and mainly covers well-known AI writing tools like Grammarly, ChatGPT, and Quillbot. The study objectives are meant to contribute to the generation of findings that can be useful across a range of academic fields for making improvements to data usability in the higher education arena.

1.8 Limitations of the Study

While this study offers valuable insights, several limitations must be acknowledged. First, because the study focuses primarily on self-reported data, biases like overestimation or underestimation of the actual impact of AI tools on writing skills. Students may perceive improvements that are not fully measurable or may fail to recognize subtle changes in their writing proficiency. Second, the study is limited to specific AI writing tools. Writing tools such as Grammarly and ChatGPT, and may not capture the effects of less commonly used or emerging tools, thereby narrowing the scope of applicability (Rane et al., 2024). Another limitation is the study's reliance on a specific demographic—university students—who may have varying levels of access to AI tools based on institutional resources or personal technological proficiency. This could potentially cause variation in the application frequency, and impact on the efficacy of the AI tools across the samples, impacting consistently revealing findings. Moreover, the study may not consider the impacts of tool usage deep enough due to a probable short period of the investigation (Huangfu & Atkinson 2020). This short-term focus reduces the chances of identifying if writing abilities have been enhanced in the long run or if the usage of AI tools is made. Finally, it is clear AI tools can offer recommendations but such advice comes premised on algorithmic functioning and excludes unique academic writing requirements like constructing logical arguments or critical thinking likely to limit the findings of the study.

1.9 Operational Definitions

1. AI Writing Tools: Software applications such as Grammarly, ChatGPT, and Quillbot that provide automated feedback on grammar, style, coherence, and vocabulary to assist students in improving their academic writing.

2. Academic Writing Skills: Writing skills, writing coherence, critical analysis, proper grammar, use of relevant words and arguments, citation and referencing in academic writing.
3. Feedback Quality: The rating given to the usefulness, effectiveness, and reliability of the feedback of AI agents in enhancing structural organization, content qualities, and stylistics of the texts.
4. Writing Anxiety: The amount of pressure felt by students while undertaking tasks that involve writing academic compositions as indicated by the students themselves.
5. Frequency of Use: The number of times students use AI writing tools over a specified period, assessed through survey or usage logs.

1.10 Thesis Structure

This thesis will comprise of five chapters. Chapter One (introduction) includes an overview of the research, including the background of the study, problem statement, research objectives, significance, scope, and limitations. Chapter Two (Literature Review) explores existing studies on AI writing tools, academic writing skills, and related theories such as feedback mechanisms and learning models. Chapter Three (Methodology) identifies the research approach, data collection instruments, participants, and data analysis strategies to evaluate the effect of the AI tools on the students' writing. Chapter Four (Findings and Discussion) comprises the findings of the study where data collected is discussed against the set objectives and prior literature. Chapter Five (Conclusion and Recommendations) synthesizes key ideas, elucidates on the significance for practice, and provides recommendations regarding the future of research on AI tool implementation in the context of academic writing instruction.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

Chapter two provides a thorough analysis of the current literature related to the application of AI writing tools in academic settings. It explores key concepts such as academic writing skills, the value of feedback in the learning, the possible advantages and the challenges of AI-assisted writing. This chapter also examines relevant theoretical frameworks, including constructivist learning theory and feedback models, to contextualize the study (Kumar et al., 2023). Furthermore, it highlights gaps in current research, particularly regarding the long-lasting impact of AI tools on writing proficiency and critical thinking. This review establishes the foundation for the study's research framework and methodology.

2.2 Theoretical Framework

Constructivist Learning Theory, developed by educational theorists such as Jean Piaget and Lev Vygotsky, emphasizes that learning is an active, constructive process where learners build new knowledge based on their prior experiences and interactions with the environment. According to Mutanga (2024), applying the above theory in the context of academic writing, it posits that students acquire writing skills through systematic actions of writing then receiving feedback in form of correction and polished writing skills. Constructivism suggests that students are not passive recipients of information who wait to be taught, rather they play great role in the learning process as they build their knowledge through meaningful learning experiences. AI writing tools are consistent with constructivist principles in that students receive an immediate constructive feedback on their writing. Such tools allow students to manipulate language and gain the understanding of language structure and argumentation in order to get feedback for improvements

immediately. For instance, as claimed by Raheem et al. (2023), Grammarly or Quillbot provides suggestions on the corrections and explanations of grammar mistakes and students' performance reinforces the comprehension of language rules. This constant cycle of feedback enhances self-regulation, which is one of the major principles of constructivism as learners become their own instructors when it comes to correcting their papers and enhancing their writing. The tools support a practice-based learning model where students observe the effects of changes on their writing results, making the learning process more effective through experience.

Furthermore, Zaretsky (2021) articulated that Vygotsky's concept of the Zone of Proximal Development (ZPD)—the difference between what learners can achieve independently and what they can achieve with guidance—highlights the relevance of AI writing tools. These tools function as a framework giving learners the support they require to complete comparable tasks but slightly more difficult and complex than those that they can accomplish independently. For example, feedback on coherence and style may help students to create better arguments on their own, which they would not be capable of doing. When students apply it, they progress to become more independent, and their dependence on such directions decreases in the long-run. However, constructivist theory also emphasizes the prospects and limitations of AI tools. Although, they can improve topical knowledge and mechanics like grammar and syntax, AI applications, as mentioned by George et al. (2024), can fail to improve higher-order skills like critical thinking, as well as argumentation. Therefore, according to the theory proposed, an AI tool should work in parallel with feedback from the instructor to provide a more comprehensive approach to skill acquisition.

2.3 Review of Literature

2.3.1 Relationship between Ease of Use of AI Writing Tools and Academic Writing Skills

The ease of use of AI writing tools plays a significant role in their adoption and impact on academic writing skills. Perceived usefulness and perceived ease of use were established by Davis's Technology Acceptance Model (TAM) as the two key determinants of user acceptance of new technologies (Davis, 1989). Stating that students use AI tools given that they are easy and convenient to use, the writer underlined that increased use of these tools improves students' writing skills. Research conducted by Li and Yu (2021) shows that those students who find easy to use AI writing tools are willing to adopt them into their writing activities that have received positive impact on grammar, structure, and vocabulary. As well, it became evident that there are many problems connected with the issue of use-ful interfaces and the reduction of people's cognitive load due to the simplification of interfaces not directly connected with content creation and studying. However, some scholars point at certain risks that could happen in the future. For instance, Bhatia (2020) pointed out that use of ease of use enhances the learning frequency as it provides only the automated corrections of the students' work without providing the profound knowledge concerning the same. As a result, incorporating AI into the process must be supported by additional features explaining how to use the feedback provided in writing assignments more effectively rather than limiting students to accepting corrected texts.

2.3.2 Impact of Feedback Quality on Academic Writing Development

Feedback quality is crucial in determining the effectiveness of AI writing tools in enhancing academic writing skills. Carless (2022) noted that feedback should be timely, specific, and actionable because it is meant to help the learner. Programs such as Grammarly and Turnitin

give an instant response in terms of grammar, punctuation and style, which is definitely useful in a teaching-learning process that involves give and-take feedback. Wilson and Rosenthal (2020) explained that the students who got a well-structured constructive feedback from the AI tools significantly improve the coherence and argumentation in the writing. Nevertheless, critics still have some worries as to the drawbacks of having AI for giving feedback. For example, as Dikli and Bleyle acknowledge (2022), existing AI tools tend to deliver solutions at the more procedural level of writing, definitions of grammar and syntax but fail to address the higher cognitive levels of thinking and ideas production such as, critical thinking, argument creation, and the idea of creativity. It is however important to acknowledge that this restriction does mean that the tool lacks other features that allow for more human feedback in other facet of academic writing. Moreover, general feedback can mislead students especially in various writing assignments and this point to the need AI based applications to grow in the area of giving contextual feedback.

2.3.3 Reduction of Writing Anxiety and Its Impact on Writing Performance

Writing anxiety is a common challenge among university students, often hindering their ability to produce quality academic work. AI writing tools have been recognized as likely applications that can help reduce this anxiety as they offer non-critical feedback in real-time. As per Lin and Chen (2024) it was determined that students who use the AI tools reported low anxiety because of the assistance they are given right away which spares them the stress of making mistakes. This is in conformity with Bandura's self-efficacy theory which maintains that perceived competence minimizes anxiety and enhances performance (Bandura, 1997). Further, Green and McCarthy (2021) have found that more students produce better work when they use AI systems to write the initial drafts and to make necessary changes before submitting their works. However, one must admit that the over-usage of the given tools might lead to negative consequences. For

example, Huang and Lee (2020) pointed out that while using the AI-generated corrections as a study aid may be helpful, students could quickly become overly reliant on the tool and might weaken their editing and polishing skills. Thus, despite the fact that AI tools can help alleviate writing anxiety, it is critical to integrate further approaches to develop autonomous writing skills.

2.3.4 Influence of Frequency of AI Tool Usage on Academic Writing Skills

The frequency of AI writing tool usage is another critical factor influencing the enhancement of academic writing skills. Utilizing these tools in a regular basis can provide continuous feedback, reinforcing learning and promoting incremental improvements in writing quality. Research by Jones and Wang (2021) asserted that students polishing their papers every day for a semester with AI writing tools improved their grammar, coherence, and clarity significantly more than those who only polished their papers occasionally. This means that frequent usage of AI-based feedback can help in the improvement of writing performance due to the compounded process. Yet, the correlation between the frequency of use and learning gains is not direct. According to Biber and Gray (2020) AI can work against the development of autonomous writing skills, as equipping the students with the perfect tool for correcting their work may mean they will spend more time focusing on correcting than learning how to write. Further, Lim and Koo (2022) have highlighted the issue of model appropriate usage; authors who paid critical attention to the proofreading and editing suggestions provided by the AI system could have much more benefits in the long run. Therefore, the usage of AI tools should be informed by the rate at which learners would be using it for maximum learning to occur alongside reflective practices.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Overview

In chapter three, it will outline the research methodology for this study. This study will use a mixed-methods approach by integrating qualitative and quantitative data collection approaches. The use of qualitative methods, specifically interviews, allows for an in-depth exploration of students' perceptions and experiences with AI writing tools, providing rich, contextual insights (Mogavi et al., 2024). Quantitative methods, through survey, will capture broader trends and statistical relationships regarding the impact of AI tools on academic writing skills. This dual approach enables a comprehensive analysis of the research objectives, offering both numerical data and detailed personal perspectives to enrich the findings.

3.2 Research Method

This research employs qualitative and quantitative research approaches to capture how these AI writing tools affect students' academic writing skills of university students. The qualitative component is conducted by administering semi structured questionnaires while the quantitative component is done by administering questionnaires. Combining both approaches should give a richer insight into the subject, as well as quantitative data on the usage and enhancements in writing as well as the participants' subjectivities towards the utilization of AI tools. Using the qualitative method of the study is well appropriate to capture the complex feelings of students on how AI tools influence their action, emotions, and self-confidence towards academic writing (Malik et al., 2023). As opposed to survey, interviews allow participants to weigh in on specific questions with answers that may reflect their sentiments and feelings in a format not easily measured with checklists. Conversely, the quantitative method will be employed in determining

more extensive trends across a large population for statistical evaluation of AI tool usage frequency, writing enhancements, and other factors such as feedback quality, and anxiety levels. The use of both quantitative and qualitative data in the present research adds reliability, as the findings are triangulated, which means that they are compared in such a way as to check the validity of the results obtained.

3.3 Research Design

The research follows by an explanatory sequential mixed-methods design, which involves two distinct phases. The first phase will involve the administration of survey to a large sample of university students who have used AI writing tools. The survey data will help identify broad trends and correlations, such as the relationship between AI tool usage frequency and improvements in academic writing skills (Stöhr et al., 2024). In the second phase, semi-structured interviews will be conducted with a smaller group of students to explore their personal experiences and perceptions of AI tools in greater depth. In this design, the quantitative phase informs the qualitative phase. Initially, the survey will be used to gather data on the overall impact of AI tools on students' academic writing skills. The survey findings will guide the development of interview questions in the next phase, focusing on areas that require deeper exploration (Buschle, Reiter & Bethmann 2022). This stepwise approach allows the researcher to refine the focus of the study based on initial findings and provides richer, more meaningful insights that are grounded in both statistical analysis and personal experiences.

3.4 Instrumentation

To collect data, two primary instruments will be used: a survey and an interview guide. The instrument for data collection in the study will be an online self-administered survey that is informed by quantitative research questions meant to measure the frequency of usage and

perceived the effect of AI writing tools on the research writing skills of the participants. The survey questions will involve both closed-ended questions with Likert scale responses, multiple choice questions and a few open-ended questions dedicated for demographic details of users along with their precise usage patterns (Nguyen & Dieu 2024). It will encompass factors such as the level of simplicity of use of AI related tools, how frequently one uses these tools, feedback given, and overall writing stress alleviation. In this study, the survey will be administered electronically to a large and diverse group of university students with a view of obtaining data that will be representative of this population. The interview questions will be largely unstructured with some probing questions that will be used to ask students about their experiences using AI writing tools. Through the interviews, it will be possible to determine the extent to which students recognize the usefulness of the tools in enhancing their writing, how the use of the tools influences their confidence and anxiety and the difficulties that they experience when using the tools (Lin & Chen 2024). The questions for interview will be generated from the survey questions where more depth exploration will be made concerning those areas interpreted to need extended information such as the quality of feedback offered by AI tools and the impacts on writing skills in the long-run.

3.5 Population of the Study

The population for this study includes university-level students who have utilized AI writing tools in their academic writing process. Participants will be selected based on the faculties they belong to so that it will be easy to compare the impact of utilized AI tools in their writing skills among different faculties. University students are selected because they are involved in a lot of writing activities and are likely to have used AI writing tools such as Grammarly, Turnitin among others (Raheem, Anjum & Ghafar 2023). The study will mainly involve university students in a particular region or country who have access to these tools through their institutions or their

own accounts. Due to the nature of research, participants shall include students from different fields to make the results generalizable to the population of students. The inclusion criteria involve participants who selected an AI writing aid during the previous academic semester.

3.6 Sampling and Sample Size

For the quantitative phase of the study, a probability sampling technique will be used to ensure that the sample is representative of the overall student population. In particular, stratified random sampling is chosen to guarantee the representation of students from different faculties and stages – undergraduate and graduate – in the sample (Jayasingha & Suraweera 2020). This method will in particular assist in capturing a diversity of perceptions with regard to AI writing tools in academic writing. The Krejcie and Morgan (1970) table will be used to determine the sample size for the survey for the total population. For instance, if the total population is 10,000 students than the identified sample size would be around 370 students if we aim to get a confidence level of 95% with a margin of error of 5%. This sample size is sufficient enough to make reliable estimates and generalizations while being feasible in the conduct of the study. For the qualitative phase, purposive sampling will be used to recruit a limited number of individuals for interviews (Islam & Aldaihani 2022). This group will include students who have often used the tools and are willing to deliberate on the using of the tools. It is proposed to conduct about 10-15 interviews because this number of participants is sufficient for the qualitative analysis of the interviews and is not very time-consuming for detailed processing.

3.7 Data Collection Methods

The data will be collected using these two methods, which are by using survey and semi-structured interviews. The quantitative data will be collected from the target population using an online structured questionnaire. Besides that, closed and open-ended questions will also be used

in the online survey to collect qualitative and quantitative data on students' usage of the tools, the ease of their use, the quality of feedback received, and the extent to which they help reduce writing stress and improve academic writing (Khlaif et al., 2024). They will be distributed through mailing lists of the university (UTAR) or through social media groups to as many students as possible will be invited to participate in the survey. The second part of the study is of a qualitative nature; therefore, the participants will be administered semi-structured interviews. These interviews will be conducted in a way that seeks to understand the participants' own experience and opinions on the effects of the tools on skills, confidence and anxiety related to writing. The interviews will be in a face-to-face format with the students or through available video conferencing software depending on the availability of the students. All interviews will be tape recorded and transcribed with the respondents' permission for the purpose of analysis.

3.8 Data Analysis Methods

As for the quantitative data, descriptive and inferential statistical methods will use to analyze the survey results. Descriptive statistics will summarize the data, such as the frequency and percentage of students who use these tools, their perceived impact on writing, and the relationship between tool usage and improvements in writing skills (Gayed,et al., 2022). On the other hand, inferential statistics like correlation analysis or regression analysis will be used to examine the relationships between variables such as the ease of use, frequency of AI tool usage, and academic writing performance. Thematic analysis will be used to determine the recurrent themes and patterns from the interview transcripts for the qualitative data. By using this method, it will allow the researcher to categorize and interpret participants' responses based on key topics related to the research objectives, such as the quality of feedback, writing anxiety, and the overall

impact of AI tools on writing skills. Thematic analysis is particularly useful for extracting in-depth insights from open-ended questions and interviews.

CHAPTER FOUR

FINDINGS & ANALYSIS

4.1 Introduction

This chapter presents the quantitative and qualitative results of the research that aimed to investigate the use of AI writing tools by undergraduate students and the impact of these tools on their academic writing ability. To contextualize the results, the chapter starts with the demographic overview of the participants. It then evaluates the validity and reliability of the measurement tools, and then conducts statistical tests involving correlation and regression analysis to investigate the relationship between key variables and writing performance. Thematically informed student interviews are also a part of the chapter, offering more insight into user experiences, perceptions, and the actual role of AI tools in forming the writing processes and academic outcomes.

4.2 Demographic Characteristics

The sample size of the respondents covers 370 undergraduate students, which gives a background of the population that works with AI writing tools. It is crucial to understand age, gender, and ethnicity because it helps provide a context in which differences in how these tools are viewed and used among different student groups are explained. Table 4.1 summarizes the demography of the participants.

Table 4. 1: Demographic Characteristics of Respondents (N = 370)

Variable	Category	Frequency	Percent (%)
Age	18–20	84	22.7
	21–23	210	56.8
	24–26	56	15.1

	27–29	20	5.4
Gender	Male	113	30.5
	Female	257	69.5
Ethnicity	Chinese	199	53.8
	Indian	123	33.2
	Malay	48	13.0

As shown in Table 4.1, most of the respondents fell within the age group of 21 to 23 years (56.8%), which is the age bracket of students in the mid-to-final years of undergraduate studies. The number of students between the ages of 18 and 20 constituted 22.7% of the sample, and students between the ages 24 and 26 constituted 15.1%. A smaller segment of respondents (5.4) belonged to the 27 to 29 age group, which could indicate that either mature-age students were given the question or that these respondents had spent considerable time in their education.

Gender wise, the sample was more females with 69.5 percent of the respondents and 30.5 percent male respondents. Such gender balance can manifest as enrolment patterns in certain academic programmes or as larger changes in the use of education technologies, which is important in understanding any gendered trends in the use or perception of AI writing technologies.

Ethnic distribution the sample was diverse with majority being Chinese (53.8%), followed by Indian students (33.2%), and the Malay students made up 13.0% of the students. This pattern is representative of the multicultural nature of the student body in most Malaysian institutions of higher education and can be significant in the determination of cultural issues that might be important in writing preferences or feedback interpretations, or technology adoption behaviours.

4.3 Validity and Reliability

To assess the construct validity of the measurement instrument, a factor analysis was conducted using principal component extraction with varimax rotation. As shown in Table 4.2, the Kaiser-

Meyer-Olkin (KMO) measure of sampling adequacy was 0.713, indicating a middling yet acceptable level for factor analysis (Kaiser, 1974). Bartlett's Test of Sphericity was significant, $\chi^2(435) = 7496.072$, $p < .001$, supporting the factorability of the correlation matrix.

Table 4. 2: KMO and Bartlett's Test of Sampling Adequacy

Test	Value
Kaiser-Meyer-Olkin Measure	.713
Bartlett's Test of Sphericity	
Approx. Chi-Square	7496.072
Degrees of Freedom (df)	435
Significance (p-value)	.000

As shown in Table 4.3, the factor analysis extracted five components, corresponding to the study constructs: Ease of Use (EOU), Quality of Feedback (QOF), Writing Anxiety (ANX), Frequency of Use (FOU), and Academic Writing Skills (AWS). Each item loaded strongly (≥ .617) on its respective component with minimal cross-loadings, confirming convergent and discriminant validity.

Table 4. 3: Rotated Component Matrix

Item	Anxiety	Ease of Use	Frequency of Use	Writing Skills	Quality of Feedback
ANX1	.904				
ANX2	.879				
ANX3	.857				
ANX4	.803				
ANX5	.890				
ANX6	.886				
EOU1		.856			
EOU2		.709			
EOU3		.752			
EOU4		.738			
EOU5		.733			
EOU6		.811			
FOU1			.845		
FOU2			.697		
FOU3			.684		

Item	Anxiety	Ease of Use	Frequency of Use	Writing Skills	Quality of Feedback
FOU4			.678		
FOU5			.680		
FOU6			.798		
AWS1				.835	
AWS2				.709	
AWS3				.670	
AWS4				.682	
AWS5				.697	
AWS6				.789	
QOF1					.730
QOF2					.617
QOF3					.712
QOF4					.657
QOF5					.698
QOF6					.669

Note. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

To determine internal consistency, Cronbach's alpha was computed for each of the five scales. As shown in Table 4.4, all variables demonstrated acceptable to excellent reliability. The Academic Writing Skills scale had a Cronbach's alpha of .832, Ease of Use was .868, Quality of Feedback was .790, Writing Anxiety had the highest internal consistency at .936, and Frequency of Use showed solid reliability with an alpha of .840. These values surpass the commonly accepted threshold of .70 (Nunnally & Bernstein, 1994), indicating that the items for each construct are consistently measuring their respective dimensions.

Table 4. 4: Reliability Coefficients for Study Constructs

Construct	Cronbach's Alpha	No. of Items
Academic Writing Skills (AWS)	.832	6
Ease of Use (EOU)	.868	6
Quality of Feedback (QOF)	.790	6

Writing Anxiety (ANX)	.936	6
Frequency of Use (FOU)	.840	6

These results suggest that the instrument employed in this study possesses both construct validity and internal reliability, thereby allowing for accurate measurement of the variables under investigation. The clear structure in factor loadings and high reliability coefficients collectively support the robustness of the measurement tool used.

4.4 Results

To obtain the quantitative results, the relationships between the independent variables (Ease of Use, Quality of Feedback, Writing Anxiety, and Frequency of Use of AI writing tools) and the dependent variable (Academic Writing Skills) were examined using Pearson correlation and multiple linear regression analyses. Table 4.5 presents the correlation coefficients, and Table 4.6 displays the standardized regression coefficients for each predictor variable.

Table 4. 5: Pearson Correlations Among Key Study Variables

Variable	**1. Ease of Use**	**2. Quality of Feedback**	**3. Anxiety**	**4. Frequency of Use**	**5. Academic Writing Skills**
1. Ease of Use	1				
2. Quality of Feedback	.221**	1			
3. Anxiety	–.057	–.007	1		
4. Frequency of Use	.134**	.257**	.016	1	
5. Academic Writing Skills	.130*	.051	–.064	.098	1

Note. *N* = 370. **p** < .01 (**), **p** < .05 (*)

As shown in Table 4.5, Ease of Use was positively correlated with Academic Writing Skills (r = .130, p = .012), as was Frequency of Use (r = .098, p = .060), although the latter did not reach statistical significance. Quality of Feedback showed a weak, non-significant correlation (r = .051,

p = .331), and Anxiety was negatively but also non-significantly related to Academic Writing Skills (r = –.064, p = .218).

To assess the unique contribution of each variable, a multiple linear regression analysis was performed. The model used Academic Writing Skills as the dependent variable and included all four predictors.

Table 4. 6: Multiple Regression Coefficients Predicting Academic Writing Skills

Predictor	**B**	**SE**	**β**	**T**	***p***
(Constant)	3.618	.334	–	10.837	.000
Ease of Use	0.102	.047	.115	2.166	.031*
Quality of Feedback	0.004	.061	.004	0.065	.948
Anxiety	–0.036	.032	–.059	–1.141	.255
Frequency of Use	0.080	.052	.083	1.541	.124

Note. *Dependent Variable:* Academic Writing Skills
$p < .05$ (*)

Ease of use of AI tools had a significant positive relationship with academic writing performance (r = .130, p = .012), suggesting that students who perceived AI tools as easier to use reported better writing skills. Regression analysis confirmed this effect, with a significant standardised coefficient (β = .115, p = .031), supporting the hypothesis that ease of use positively predicts writing performance.

Contrary to expectations, the quality of feedback did not significantly correlate with academic writing performance (r = .051, p = .331). This lack of significance was reflected in the regression results (β = .004, p = .948), suggesting that students' perceptions of feedback quality from AI tools did not substantially predict their academic writing skills.

Writing anxiety exhibited a negative but non-significant correlation with academic writing (r = –.064, p = .218), and the regression analysis produced a similar result (β = –.059, p = .255).

Although the direction aligned with the hypothesis, the findings indicate that writing anxiety did not statistically influence students' writing performance in this sample.

The frequency of AI tool usage was weakly but positively correlated with academic writing skills ($r = .098$, $p = .060$), just falling short of the traditional threshold for significance. In the regression model, frequency of use also did not serve as a significant predictor ($\beta = .083$, $p = .124$). Although in the expected direction, these results do not establish a strong link between frequent use and enhanced academic writing.

To complement the quantitative findings, interview responses from ten student participants were analyzed thematically using NVivo. The resulting themes reflect rich insights into students' experiences with AI writing tools, specifically in relation to ease of use, the quality of feedback, writing anxiety and frequency of use.

The students generally said that AI writing tools were easy to find and use, and they needed little to no help to acquire. The three key themes that came out in terms of ease of use, as indicated in Figure 1, were Needs no tutoring, User-friendly, and Very intuitive. The respondents mentioned that the tools were easy to use and navigate, and they did not need formal tutoring or training to use them. These perceptions were supported by remarks that talked about how you simply open it and begin typing or that it feels natural to communicate with it. Responsiveness of the interface was also appreciated by the participants, besides the simplicity of the interface.

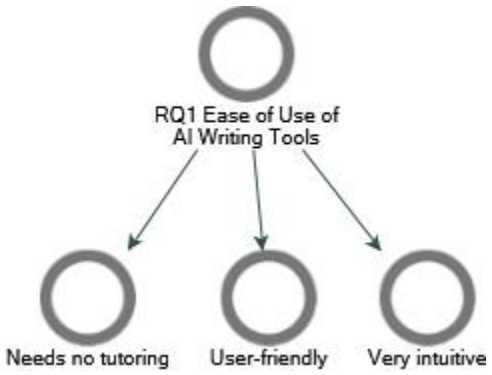

Figure 1. Project map for RQ1: Ease of Use of AI Writing Tools

Four core themes were identified when confronted with the question of comparing AI tools to human sources and these were, More Immediate, Non-Judgmental, Specific & Actionable, and Consistent Feedback. Students as in Figure 2 observed that in contrast to feedback received through professor or peer, timely feedback could take days or weeks before receiving the feedback. AI tools offered immediate feedback. Such urgency enabled students to revise their work in time and not to interrupt their work. Besides, participants noted that AI feedback was not judgmental; it did not imply any emotional overtones and just corrected and made suggestions, which lowered the anxiety that criticism can cause. More so, the AI feedback was specific and actionable, as students indicated specific structural or grammatical mistakes and offered specific suggestions to fix the writing. Stability also turned out to be an appreciated quality, with the AI remaining at an even level irrespective of the time and the days of access. This reliable degree of support allowed the students to perfect their writing through repetition and self-help.

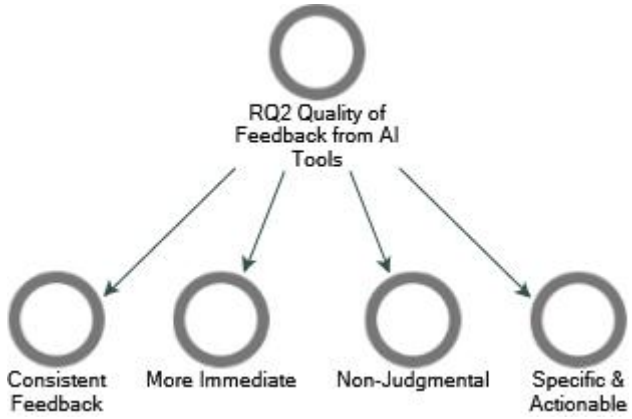

Figure 2. Project Map for RQ2: Quality of Feedback from AI Tools

To answer the question of whether students felt less stressed or experienced less anxiety after performing a writing task with the help of AI tools, there were four major themes that could be identified according to the mixed responses: Reduced Stress on Initiation, Reduced Writing Anxiety, Reduced Time Pressure, and Confidence of Assured Support. Students reported the positive influence of AI tools on their emotional experience of academic writing as in Figure 3. It was observed that those who began their assignment with reduced stress experienced a substantial drop in stress when using AI-generated draughts or outlines due to the fact that the first step of starting their assignment was no longer a challenge. Some said that the immediate access to AI tools gave them a feeling of safety, and it reassured them, relieving anxiety and making them feel more confident. Some of the respondents also pointed out that the tools also helped them be more efficient and meet strict deadlines, thus alleviating the stress that is normally related to time. These mental advantages made the students more relaxed and clear in their writing assignments.

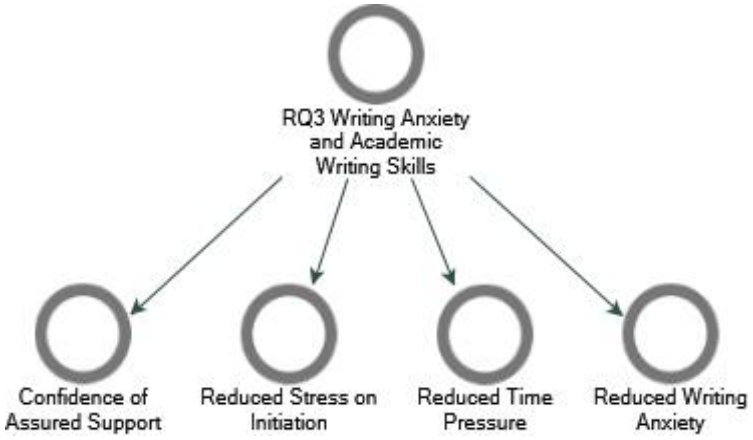

Figure 3. Project map for RQ3: Writing Anxiety and Academic Writing Skills

Students answered the question of how and why they use AI writing tools and the answers provided three primary reasons: To generate ideas, To meet deadlines, and To improve language and grammar. The frequency at which the AI tools were used did not depend on habitual or general dependence, as Figure 4 demonstrates that the AI tools were used due to particular academic requirements. The respondents described how they used AI tools when they had a strict deadline to meet because they could generate or edit content faster with the help of the tools. Also, the respondents explained their use of AI as part of the idea-generation phase, particularly when experiencing writer-block or lack of inspiration. The third reason why AI is used in writing is about the usefulness of the tools in improving the clarity, grammar, and tone. These diverse, task-based patterns of application demonstrate the practical flexibility of AI writing tools in the academic writing process at different phases.

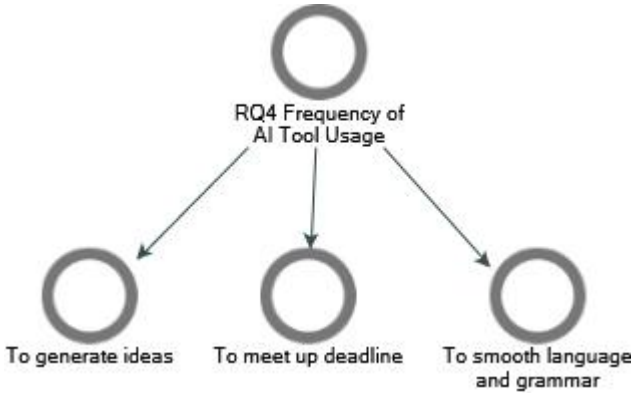

Figure 4. Project Map for RQ4: Frequency of AI Tool Usage

Though participants were generally positive, some worries were expressed regarding the use of AI writing tools. These additional areas of concern are addressed in Figure 5, which identifies four central areas of concern: limits collaboration, generates generic or off-topic results, needs to cheque facts twice, and brings up the issue of credibility. Respondents cautioned that the output may be generic or off-topic at times and users will need to interpret and further refine the suggestions. Also lies credibility of information offered by AI, as it is mentioned that facts should be verified, in particular, in research-based works. Respondents noted that despite the ability of AI tools to assist in individual work, they can unintentionally inhibit interaction with peers or instructors. These problems act as a reminder that despite the usefulness of AI tools, they are supposed to be used critically and as supplements to other academic materials.

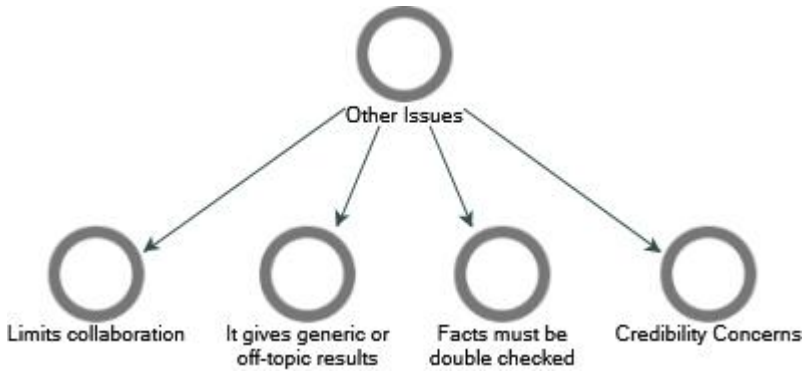

Figure 5. Project Map for Other Issues Raised by Respondents

The qualitative data indicate that students regard AI writing tools as user-friendly, easy to use, and effective in assisting them in academic writing. They discovered that the tools helped them to streamline their work, decrease stress related to writing, and provide immediate and actionable feedback. Nonetheless, participants were also aware of having to critically engage the tools to obtain substantial academic results.

4.5 Summary of Findings

This paper explored how AI writing tools affect the academic writing competence of students through four important variables namely ease of use, quality of feedback, writing anxiety and frequency of use. The findings were both statistically inclined and experiential, and they do provide an understanding of how students interact with AI writing technologies.

Quantitative results indicated that ease of use was a substantial predictor of academic writing ability, indicating that students who found AI tools easier to use and more available had a higher likelihood of reporting higher writing ability. The frequency of use was found to be positively correlated with the writing skills but it was not reported as being significant. The quality of feedback and writing anxiety did not have significant predictive power in the regression model but

rather the qualitative relevance of these factors came out during the process of student sharing of their narratives.

The interviews were thematically analysed to add to these findings. Students talked about AI tools as being user-friendly, simple, and needing no formal training- point out that they are intuitive and have the possibility of simplifying the writing process. An AI feedback was appreciated as instant, non-judgmental, specific, and consistent and allowed students to make prompt and clear revisions despite the fact that these features were not always associated with practical academic success.

The participants also spoke about the emotional advantages of using AI tools, such as decreased stress and anxiety, particularly, in the initial steps of writing. The aids alleviated time stress, provided a sense of security by the promise of assistance and made the process of starting the writing process less overwhelming. Regarding usage patterns, students claimed to resort to AI tools most often to find ideas, satisfy deadlines, and improve the clarity and grammar, which are more strategic and goal-oriented.

Nonetheless, a number of concerns have been mentioned as well. Students pointed out that AI-generated content may be generic, may be inaccurate and need fact-checking. Also, the possible restriction of cooperation with peers or instructors in favour of AI was observed, and the critical use is highly important.

CHAPTER FIVE

DISCUSSION & CONCLUSION

5.1 Introduction

This chapter addresses the results of the study and contextualizing it with regard to the literature and theoretical predictions. It examines the impact of such critical variables as ease of use, the quality of feedback, writing anxiety, and frequency of use on the academic writing skills of students who used AI writing tools. Combining quantitative and qualitative findings, the chapter provides a more subtle explanation of the findings, distinguishing the patterns and pointing out the instances in which perception and performance did not match. To contextualize the results in terms of the vast scholarly debates, the discussion also relies on the relevant empirical studies. Besides answering the main research questions, the chapter also contemplates some unexpected findings during the interviews, including problems related to collaboration, content reliability and academic integrity. Nevertheless, these concerns do not receive much emphasis, but there is also valuable pedagogical and ethical implication. The chapter ends by making a conclusion of the implications of the study, future research recommendations, and a conclusion on whether the study is important and has limitations or not.

5.2 Discussion

5.2.1 Ease of Use and Academic Writing Skills

The quantitative findings of this study revealed a statistically significant positive relationship between students' perceptions of the ease of use of AI writing tools and their academic writing skills. Specifically, the Pearson correlation ($r = .130$, $p = .012$) and multiple regression analysis ($\beta = .115$, $p = .031$) both confirmed that students who found AI tools more user-friendly tended to report stronger writing performance. This finding suggests that usability acts as a meaningful

enabler of writing improvement, likely because tools that are intuitive and accessible lower the cognitive barriers to entry and encourage more frequent, self-directed engagement.

The qualitative findings reinforced this statistical pattern. Interview participants consistently described AI writing tools such as Grammarly, ChatGPT, and Quillbot as "intuitive," "user-friendly," and "requiring no formal instruction." Students highlighted that they could “just open the tool and start typing,” and that the interface “felt natural” to use. These descriptions suggest that low-effort onboarding and interface simplicity reduced friction and made the tools more appealing for daily academic writing tasks. Students were also more likely to use the tools iteratively during the drafting and revision process, reinforcing their skills through practice-based learning, a core concept in constructivist pedagogy.

These results are strongly supported by recent empirical literature. Alkamel & Alwagieh (2024) found that the intuitive nature of ChatGPT led to increased engagement and improved writing performance among Yemeni university EFL students. The tools’ accessibility allowed learners to develop confidence and fluency without formal training. Similarly, Yu (2025) identified usability as a primary predictor of user satisfaction and perceived academic benefit; students who rated AI tools as easy to use were also those who reported noticeable improvements in writing fluency, grammar, and clarity.

In the same vein, Khan et al. (2024) showed that Bangladeshi EFL students strongly associated ease of use with enhanced writing outcomes. They emphasized that tools like Grammarly were not only effective but motivated repeated use, particularly among students with limited linguistic confidence. Aljuaid (2024) also confirmed that user-friendly AI platforms encouraged students to revise more frequently and independently, thereby promoting self-regulated learning—a process closely linked to writing skill development.

Furthermore, Al-Sofi (2024) highlighted how ease of use supports self-efficacy in writing by making students feel more competent and autonomous in managing their texts. These studies collectively validate the conclusion that ease of use plays both a functional and motivational role in enhancing academic writing, especially in ESL/EFL contexts where linguistic challenges may otherwise deter active engagement.

However, the literature also emphasizes important caveats. Studies by Al-Bukhrani et al. (2025) and Anani et al. (2025) suggest that while ease of use promotes tool adoption, its impact on deep writing skills depends on user behavior. Without critical engagement, students may rely on tools for surface-level corrections (e.g., grammar, syntax) without internalizing writing conventions or improving higher-order thinking skills such as argumentation and synthesis. These researchers argue that motivation, reflective usage, and instructional guidance are necessary for students to move beyond tool dependence and toward actual skill mastery.

This may explain why, despite the significant relationship observed in this study, the effect size of ease of use on writing performance was relatively modest ($\beta = .115$). It is likely that ease of use facilitates initial engagement and removes barriers to entry, but does not guarantee deeper learning unless accompanied by critical thinking and active revision strategies. Some students may simply accept AI-generated suggestions without questioning them, thus limiting opportunities for growth in rhetorical and analytical skills.

5.2.2 Quality of Feedback and Academic Writing Skills

The second research question aimed to examine whether students' perceptions of the quality of feedback from AI writing tools were associated with measurable improvements in academic writing skills. Contrary to initial expectations, the quantitative analysis showed that feedback quality was not a significant predictor of writing outcomes. The Pearson correlation was weak and

statistically insignificant ($r = .051$, $p = .331$), and the regression coefficient similarly revealed no significant effect ($\beta = .004$, $p = .948$). These findings suggest that students who rated the feedback from AI tools as higher in quality did not necessarily report stronger writing skills.

However, the qualitative data offer a more complex and nuanced view. Students consistently described AI-generated feedback as immediate, non-judgmental, specific, and consistently available. These features were praised for facilitating timely revision and reducing emotional discomfort often associated with human critique. For instance, participants noted that AI tools "highlighted what to fix and how," and that "there's no judgment, just advice." These perceptions indicate that students valued the feedback for its practical and emotional utility—even though this perceived quality did not directly translate into statistically measurable skill improvements.

It is not only this study that finds this seeming contradiction between the subjective experience and the resulting quantitative outcome. In reality, there are a number of empirical studies that can be used to put this dissimilarity in context. Guo et al. (2024) and Deep and Chen (2025) have discovered that high-quality AI feedback can have a strong impact on writing skill and self-revision practices, especially when used as part of peer-review models or in the context of reflective writing cycles. On the same note, Song and Song (2023) indicated that the Wolfram feedback of ChatGPT enhanced the structural and linguistic output of EFL learners, especially because of its specificity and timeliness.

Nevertheless, the quality of feedback may not result in improvement by default according to other studies. Ozdere (2025) warns that students might be consumed with the complexity of AI feedback or they might not even be proficient to interpret any feedback and this can depress the educational benefits of AI. Other participants in this research transferred the same mood- they found the

suggestions helpful, but sometimes the AI gave rather unproductive, irrelevant, or too generic suggestions. Such problems are likely to water down even the best-intent feedback.

Making the situation even more complex, Zheldibayeva (2025) highlighted that although AI feedback can improve surface-level writing styles (e.g. grammar, cohesion), it might not be effective in overcoming higher order writing issues such as critical thinking, argument structure and academic voice. These are exactly the places where writing improvement is likely to be the most noticeable, but they are more difficult to analyse and fix by AI without contextual knowledge. Thus, the absence of a meaningful statistical association in this study might not be as a result of insufficiency of feedback itself but rather to do with the way the students respond to the feedback. Others can be passive receivers of suggestions, and others will use the tools mainly to make a quick edit, missing the chance to do more in-depth revision and learning. This aligns with Ahmed et al. (2024) who cautioned that feedback is important, but its efficacy is based on its processing and implementation.

Furthermore, Aljuaid (2024) and Schmohl and Watanabe (2020) reported that AI feedback also tends to make micro-level corrections, including spelling and grammar, but overlooks more meaningful aspects of academic writing. Such insights can be used to explain why the students in this study valued the feedback yet did not report significant improvements to the level of composition and argumentation at the academic level.

Although study participants reported a subjective belief in the usefulness of AI-generated feedback, this did not positively influence academic writing performance in the quantitative model. This lack of connection can be viewed in terms of the depth of engagement: feedback only becomes a skill-making process when students are engaged in the interpretation and implementation of feedback. The results resonate with the literature emerging on the topic that feedback quality needs

to be accompanied by student metacognition, pedagogical guidance, and critical reflection to result in significant academic benefits.

5.2.3 Reducing Writing Anxiety Through AI Tools and Its Impact on Academic Writing Performance

The third research question aimed to examine whether AI tools reduce writing anxiety and whether this reduction translates into improved academic writing performance among undergraduate students. Contrary to theoretical expectations, the quantitative data revealed that writing anxiety was not a significant predictor of academic writing outcomes. The correlation coefficient was weak and negative ($r = –.064$, $p = .218$), while the regression coefficient also failed to reach statistical significance ($\beta = –.059$, $p = .255$). These results suggest that students who reported higher or lower levels of writing anxiety did not differ significantly in their academic writing performance as measured by self-assessment.

However, the qualitative data paints a more nuanced and emotionally resonant picture. Students consistently described AI tools as helpful in reducing stress, boosting confidence, and alleviating writing-related anxiety, particularly at the initiation stage. Thematic analysis highlighted key themes such as Reduced Stress on Initiation, Reduced Time Pressure, and Confidence of Assured Support. Students shared that the availability of AI tools as a “non-judgmental assistant” helped them overcome the psychological barriers to beginning assignments. For example, one respondent mentioned, “I don’t panic as much when I know ChatGPT can give me a starting point.” Another added, “Even when I’m stuck, I can ask it for help—it’s like having someone there 24/7.” These insights suggest that while AI may not directly improve academic performance through anxiety reduction, it does influence the emotional conditions under which writing takes place.

Recent research also indicates this variance between statistical triviality and deep subjective experience. As an example, Shen and Tao (2025) have discovered that AI-enhanced writing conditions with metacognitive (prompts) had a significant decreasing effect on writing anxiety and augmenting self-efficacy, which eventually saw an enhanced writing outcome with the use of reflective practice. Likewise, Nazari et al. (2021) found that students who used Grammarly felt like they had decreased emotional tension and got better concentration, which helped the writing process and attention to go by smoothly.

The emotional support that AI tools offer was highlighted in other studies. According to Hawanti and Zubaydulloevna (2023), AI-generated feedback was also thought to be helpful because it is not judgmental and does not provoke the fear of a negative rating that students often have when receiving the comments of a teacher. Similarly, Song and Song (2023) established that EFL students had positive emotions and reduced anxiety when using AI tools because they found it much easier and less stressful to write.

Not every study, though, presents equally encouraging conclusions. According to Yu (2024), although using AI frequently was associated with less anxiety, the over-reliance was a concern, and in the long term, this tendency may undermine the confidence of students, unless it is checked through pedagogical assistance. The same concern was reflected in the study by Biju et al. (2024), who discovered that not all students have reduced anxiety with the help of AI tools, especially those who are less digitally literate, who remain overwhelmed by the output of the AI tool or confused by it.

More complexity was added by Yilmaz and Ustunel (2025), who noted that individual factors (self-efficacy and previous familiarity with technology) mediated the emotional benefits of AI

tools. To this end, the lack of a robust statistical correlation in the present study could be related to the fluctuation in the internalisation and reaction of AI-based support by students.

Generally speaking, although students clearly recognise such emotional and psychological benefits of using AI tools especially in alleviating stress and initiating tasks, they might not necessarily be at a measurably higher level of academic writing skill unless other factors like reflective practises, teaching feedback, and goal-focused revision schemes come into play. This view is backed by evidence such as the works of Shen and Tao (2025) and Song and Song (2023) as they stress that affective gains should be complemented by organised pedagogical support to lead to the achievement of cognitive and performance-based results.

The existing results, therefore, support the emerging view that the reduction of writing anxiety is a requirement and not a sufficient condition in improving the academic writing skills. Emotional soothing might help to engage in the task better, yet developing the skill does not need only layers of support, such as feedback literacy, critical thinking, and purposeful use of writing strategies.

5.2.4 Frequency of Use and Academic Writing Skills

The fourth research question sought to determine whether the frequency of AI writing tool usage was associated with measurable improvements in academic writing performance among undergraduate students. Quantitative analysis revealed a weak and statistically non-significant correlation between frequency of use and academic writing skills ($r = .098$, $p = .060$). Likewise, regression results failed to support frequency of use as a significant predictor of writing performance ($\beta = .083$, $p = .124$). Although the trend was in the expected positive direction, these results suggest that students who frequently use AI tools are not necessarily those who perform better in academic writing.

In contrast, qualitative data suggest a more task-oriented and functional pattern of AI use. Students reported turning to AI tools primarily to meet deadlines, generate ideas, and improve grammar and language clarity. As one participant noted, “I mostly use it when I’m stuck or need to finish something quickly.” Another emphasized, “It helps a lot with grammar and formatting but not so much with the main argument.” These narratives reflect a strategic but superficial engagement with AI tools—students often used them as productivity aids rather than developmental writing supports.

This ambivalent pattern is reflected in a number of recent empirical studies. Indicatively, Wang et al. (2024) discovered that although the frequent use of AI tools by medical undergraduates facilitated surface-level editing, it was not always able to enhance more profound features of academic writing without augmented by reflective learning or teacher support. In a similar case, Yu (2025) stated that the satisfaction of frequent users on AI tools is not directly proportional to their academic writing performance, as there were diminishing returns without the need to engage with the critical analysis.

Moreover, Tran et al. (2025) found out that EFL students tended to use AI aids to solve repetitive tasks such as grammar correction but this practise did not substantially improve the quality of academic composition in the absence of interpretive and revision-related. This concurs with Abdullah (2025), who has observed that frequency of use was related to gains in grammar and vocabulary but little in the higher-order writing abilities such as argumentation and synthesis.

Though some studies also present the positive side of using AI tools, including Aljuaid (2024) and Wu (2024), they warn against the challenge posed by the frequency of use when assessing skill development. The author highlighted that frequent use of AI could also lead to over-reliance and, consequently, less student agency and critical thinking (Aljuaid, 2024). Likewise, Wu (2024)

suggested that AI usage would result in true improvement solely when the practise was integrated into organised, thoughtful writing (Wu, 2024 PDF).

The existing research and the literature used show that frequency in itself is not a sufficient factor to improve academic writing performance. Repeated practise can potentially lead to efficiency and less cognitive load, however, transformational writing improvement seems to necessitate intentional practise, instructional scaffolding, and metacognition. In their absence, the regular users might stay on the superficial level of polishing the grammar but pay no attention to the structure, coherence, and academic voice.

Beyond the central variables of ease of use, feedback quality, anxiety, and frequency of AI tool usage, the interviews revealed a cluster of additional concerns that shaped students' experiences with AI writing tools. These issues, while secondary in focus, provide critical insight into the complexities and unintended consequences of integrating AI technologies into academic writing. Notably, four interconnected themes emerged: diminished collaboration, generic or off-topic outputs, the need for fact verification, and ethical concerns surrounding credibility and academic integrity.

Several participants reported that AI writing tools, while helpful, reduced the need for interaction with peers or instructors. One student reflected, "I used to ask classmates to read my drafts, but now I just use the AI." This sentiment suggests a shift from collaborative to solitary writing practices, potentially weakening social learning mechanisms. This observation aligns with findings by Deep and Chen (2025), who argue that excessive dependence on AI may displace pedagogically valuable activities such as peer review, collaborative editing, and mentor feedback. Cotton et al. (2024) similarly caution that the immediacy and convenience of AI feedback can lead students to

bypass co-construction of meaning with others, thereby reducing opportunities for discourse-driven learning and reflection.

Students also expressed frustration over the tendency of AI-generated content to be vague, generic, or off-topic, particularly when dealing with subject-specific or nuanced prompts. As one participant noted, “It gives answers that sound okay but aren’t really what I need.” These impressions are consistent with Kelly and Sullivan’s (2023) study, which found that students frequently criticized ChatGPT for producing formulaic responses lacking in contextual depth. Nagpal (2024) supports this concern, noting that AI systems often rely on pre-trained general knowledge, which, while linguistically fluent, can result in conceptually shallow output. This lack of specificity diminishes the instructional value of the content and often requires additional interpretation or rewriting by the student.

Another prominent concern involved factual reliability. Participants reported needing to verify the accuracy of AI-generated information before incorporating it into academic assignments. One remarked, “I don’t fully trust it—I always check facts with Google or my textbooks.” This echoes a broader concern in the literature regarding the hallucination problem in large language models. Elsayed (2024) highlights how AI-generated content, while persuasive in tone, can contain fabricated or misleading data, posing risks to academic integrity and student learning. Uzun (2023) similarly observes that students must approach AI-generated outputs with caution, especially when working on evidence-based writing tasks, as the tools may misrepresent or invent citations, requiring vigilant fact-checking and critical appraisal.

Perhaps the most complex issue raised in the interviews concerns authorship, ownership, and the broader implications for academic integrity. Several students questioned whether using AI to draft or revise their work blurred ethical boundaries. One participant asked, “If it rewrote my whole

paragraph, is it still my work?" Such reflections underscore the ambiguity surrounding AI-assisted writing and resonate with the findings of Vetter et al. (2024), who argue that students often wrestle with ethical dilemmas when composing alongside AI. Pellerin and Ogandaga (2024) propose a reconceptualization of academic integrity in light of AI's capabilities, noting that traditional standards may no longer suffice in defining acceptable support versus unacceptable substitution. Nwozor (2025) raises a more urgent warning, suggesting that without explicit institutional frameworks, the normalization of AI tool use may erode quality assurance practices and foster a culture of academic dishonesty.

These issues illustrate that while students generally appreciate the convenience and functionality of AI writing tools, they are also aware of the limitations and potential risks involved. The findings point to a clear need for critical engagement, pedagogical scaffolding, and institutional policy development to guide ethical and effective use. These concerns remind us that successful integration of AI in education must go beyond technical proficiency and address the broader cognitive, collaborative, and ethical dimensions of academic writing.

5.4 Implications

The findings of this study carry several important implications for educators, instructional designers, academic institutions, and policymakers aiming to support student writing development in an increasingly AI-augmented academic environment. As AI writing tools become more embedded in higher education, the results underscore both the potential benefits and the nuanced challenges associated with their use.

One of the clearest implications is the importance of usability in educational technology adoption. The significant positive correlation between ease of use and academic writing skills suggests that students are more likely to benefit from AI tools when the interface is intuitive and requires little

prior training. This highlights the need for institutions to prioritize the adoption of user-friendly platforms that reduce cognitive barriers to entry, especially for students with limited technological proficiency or English as a foreign language. Instructional designers and edtech providers must focus not only on functionality but also on accessibility and interface simplicity to maximize the educational value of these tools.

At the same time, the findings raise critical questions about the pedagogical integration of AI feedback mechanisms. Although students in the qualitative phase praised the immediacy, non-judgmental tone, and specificity of AI feedback, this perceived value did not translate into measurable improvements in writing performance. This gap between perception and outcome implies that feedback alone, no matter how timely or detailed, may not be sufficient to drive deep learning unless students are taught how to engage with it reflectively. Educators must therefore move beyond providing access to AI tools and incorporate metacognitive strategies, such as feedback interpretation workshops or reflective writing tasks, into the curriculum. Such scaffolding could help students move from passive acceptance of AI suggestions to critical engagement that fosters actual skill development.

The study also contributes to growing literature on writing-related affect, particularly the role of AI in mitigating writing anxiety. Although the quantitative analysis did not show a significant statistical effect, qualitative data strongly indicated that students experienced less stress, greater confidence, and reduced fear of failure when supported by AI tools. This suggests that AI technologies may serve as affective scaffolds, helping students overcome the psychological barriers that often impede writing. Institutions should consider this emotional dimension when integrating AI, recognizing that these tools may improve not only performance but also student wellbeing and engagement, especially for those who struggle with academic self-efficacy.

Moreover, the weak and statistically non-significant relationship between frequency of use and academic writing outcomes reveals that repeated exposure to AI tools does not necessarily result in academic gains. This finding has important implications for how educators frame the role of AI in coursework. Rather than encouraging frequent or habitual use, pedagogical efforts should emphasize purposeful and reflective engagement. Students must be guided to understand when, how, and why to use AI tools, shifting the focus from quantity of use to quality of interaction. This has further implications for designing assessments that evaluate not only the final written product but also the writing process, including the ways students interact with AI during composition and revision.

Lastly, the study highlights a range of unintended consequences and ethical concerns that warrant institutional attention. These include reduced peer collaboration, over-reliance on AI-generated ideas, factual inaccuracies, and growing ambiguity around authorship and academic integrity. If unaddressed, these issues could undermine collaborative learning cultures, diminish critical thinking, and challenge traditional norms of originality in academic work. To mitigate these risks, universities must implement clear policy guidelines, ethical training modules, and faculty development programs focused on AI literacy. Students need to be taught not just how to use these tools, but how to critically evaluate their outputs, cross-check information, and navigate ethical grey areas related to attribution and plagiarism.

5.5 Recommendations for Future Research

Although the current research offers important information on the impact of AI writing aids on undergraduate academic writing, there exist numerous gaps that can be considered as potential research directions in the future. The recommendations below are aimed at building on the existing

results, fill the gaps in it, and direct the researchers to work that is feasible in practise and substantive in its teaching.

First, longitudinal designs should be made use of in future research to determine how the writing capabilities of students can improve over a period of time with the continued use of AI tools. The present study provided a cross-sectional picture, which might not be a complete picture of the cumulative or delayed impact of the AI-assisted writing. The longitudinal study of writing performance through semesters, in particular with the assistance of formative feedback and revision cycles, may assist in determining more definite causal links between the use of tools and the progress of writing.

Second, it is recommended that researchers explore field-specific variations in AI writing tools usage and perception. This research gave a broader perspective of writing in undergraduate level; however there are very many differences in writing conventions in different professional fields like engineering, social sciences and in the humanities. Future research may also investigate the perception of usefulness, quality of feedback, and ethical issues related to AI tools based on the expectations of discipline, type of writing, or the writing complexity.

Third, the use of instructional mediation and teacher scaffolding in order to maximise the benefits of AI writing tools should be investigated. Although the current study reported that frequency of use alone does not predict writing gains, future studies might experimentally evaluate how guided use, e.g. by AI literacy workshops or feedback interpretation exercises or reflective prompts, can improve learning outcomes. Such interventions are comparatively simple to carry out and may provide practical measures to those instructors who would want to incorporate AI tools in their writing pedacogy.

Fourth, mixed-methods designs with both performance metrics and cognitive processes should also be involved in future research. As an example, they may be combined with writing tests and think-aloud protocols or screen-capture studies to study how students react to AI feedback in real-time. That would enable investigators to examine not only written words of students, but their decision-making processes, acceptance or rejection of the proposals, and considering their writing process facilitated by AI.

Fifth, there is an increasing necessity to examine the ethical and psychological aspects of writing that is aided by AI. As concerns credibility, authorship, and academic integrity were mentioned by students, future research can investigate how various representations of AI usage (e.g., tool vs. co-author) affect student ethical reasoning and attitudes to plagiarism. Also, the emotional response of AI, e.g., it may decrease or potentially increase writing anxiety, may be studied further with the help of psychometric scales or experimental mood induction methods.

Lastly, researchers in the future should also take into account the possibility of comparative studies in various educational settings or countries, particularly EFL and multilingual ones. This would assist in explaining how the cultural, institutional and language context influences the acceptance, use and conception of AI tools in academic writing. Because the general practise is to train AI models on English, hegemonic datasets, their availability, and their justice in non-native settings are worth increased attention.

5.6 Conclusion

This research finds that AI writing tools are positively related to the academic writing performance of undergraduate students, and that this performance is largely predicted by the ease of use of the writing tools. These tools were easily accessible and felt user-friendly to students, which contributed to their regular use and made them more confident when writing. The perceived

simplicity and immediacy of AI interfaces enabled users to spend more time on content creation and revision, simplifying the overall writing process.

Nevertheless, other variables like feedback quality, writing anxiety and frequency of use are also found not to be significantly predictive of academic writing improvement in the quantitative analysis. Even though the participants appreciated the feedback options offered by AI tools due to their specificity, non-judgmental tone, and immediacy, these aspects did not lead to statistically significant improvements in writing performance. Equally, as students regularly applied AI tools to idea generation and language refinement, a simple repetition of application was not enough to achieve significant improvement. The findings indicate that interaction with AI needs to be followed by pedagogical advice and reflective practice to reach more profound learning outcomes. Another issue that the students have brought up in the interviews is the problem of collaboration, relevance of the content to the course, the accuracy of facts and academic honesty. This information underscores the dangers of excessive dependence on AI tools without the guidance of an instructor. The results indicate that, though AI tools provide significant support systems to individual writers, they can deprive people of the possibilities to engage in collaborative dialogue and achieve higher academic levels of interaction in the case of isolating their application. Thus, AI tools cannot be introduced as alternatives to cognitive and collaborative effort; instead, they can be introduced as the tools that complement properly designed academic writing teaching. The critical approach to teaching students about how to use AI, how institutions integrate it into pedagogies, and how the ethical use of AI can be fostered as an aspect of academic culture will be critical in the successful implementation of AI in the academic setting.

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