THE EFFECTS OF AI TOOLS ON UNDERGRADUATES' ACADEMIC WRITING PROFICIENCY IN MALAYSIA

NG SHI ZHE

BACHELOR OF INTERNATIONAL BUSINESS (HONOURS)

UNIVERSITI TUNKU ABDUL RAHMAN

FACULTY OF ACCOUNTANCY AND MANAGEMENT DEPARTMENT OF INTERNATIONAL BUSINESS

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NG SHI ZHE   ACADEMIC WRITING PROFICIENCY   BIN (HONS)   MAY 2024

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BY

NG SHI ZHE

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DECLARATION

I hereby declare that:

(1)   This undergraduate FYP is the end result of my own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2)   No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3)   Sole contribution has been made by me in completing the FYP.

(4)   The word count of this research report is ____14425____ .

Name of student: Student ID: Signature:

Ng Shi Zhe   20UKB02420

Date: _____24 April 2024_____

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LIST OF ABBREVIATION

AI	Artificial Intelligence
AIED	Artificial Intelligence Education
AWE	Automated Writing Evaluation
AES	Automated Essay Scoring
AWCF	Automated Written Corrective Feedback
APP	Application
GPT	Generative Pre-trained Transformers
NLP	Natural Language Processing
GenAI	Generative Artificial Intelligence
SPSS	Statistical Package for Social Science
AWP	Academic Writing Pruriency
PL	Personalized Learning
FM	Feedback Mechanism
UF	Usage Frequency
HM	Hedonic Motivation

PREFACE

Technology has been widely prevalent in modern higher education, radically transforming old academic methods. Artificial Intelligence (AI) tools have become significant assistance in different fields of study, including language and writing, among the numerous applications of technology. This research study investigates the influence of AI tools on the writing abilities of undergraduate students, examining the various ways in which these advanced technologies affect the growth and improvement of students' writing skills.

Academic writing is a fundamental aspect of intellectual communication, requiring accuracy, clarity, and analytical thought. Nevertheless, the process of becoming skilled in academic writing is frequently filled with difficulties, encompassing obstacles such as language limitations and intricate rhetorical standards. In this context, AI systems present hopeful solutions by offering students immediate feedback, grammar suggestions, and stylistic ideas to improve their writing effectiveness. This study investigates the intersection between AI tools and academic writing proficiency among undergraduates.

This research examines the factors that influences the impact of AI tools in improving academic writing proficiency. Researcher has identified four factors which are personalized learning, feedback mechanism, usage frequency and hedonic motivation of AI tools. With the help of the study, a better understanding and comprehension of the factors that may influence how AI tools can assist in academic writing proficiency can be obtained.

ABSTRACT

The purpose of this study was to investigate the factors of Artificial Intelligence (AI) tools that have impact on Malaysia's undergraduate student's academic writing proficiency. The impact on academic writing proficiency is the dependent variable in this research study, and the independent variables—personalized learning, feedback mechanism, usage frequency and hedonic motivation will be taken into consideration as the elements influencing this variable. Students who are studying as undergraduates will be our target demographic. Using the convenience sampling approach, we administered the questionnaire to our target group in 200 sets overall.

The reliability test will be measured using Cronbach's Alpha to determine the level of reliability. Additionally, multiple regression analysis will be used to examine the data that has been obtained. Based on the research study's findings, the respondents acknowledge that AI tools' personalized learning, feedback mechanism and hedonic motivation are significant factors that contribute in improving academic writing proficiency; however, feedback mechanism shows the greatest effect. The study's findings imply that undergraduate students felt that feedback mechanism of AI tools can provide them better resources and assistance in improving academic writing proficiency.

CHAPTER 1: RESEARCH OVERVIEW

1.0 Introduction

The aim of the research is to study the effects of AI tools on undergraduates' academic writing proficiency. The factors that are involved in this study include personalized learning, feedback mechanisms, usage frequency, hedonic motivation of AI tools. These factors will be analyzed on how they affect undergraduates' academic writing proficiency. Furthermore, in this chapter, the background research on artificial intelligence (AI) will be broadly outlined, along with the problem statements, research objectives, questions, hypotheses, and research significance. As such, this research will be able to collect data regarding the degree of significance that these factors have with the academic writing proficiency of undergraduates.

1.1 Research Background

AI has been progressively utilized in recent decades to enhance many areas that have a widespread influence on our lives (Kaplan & Haenlein, 2019). AI has demonstrated its efficacy in addressing intricate challenges across diverse fields, including education. Where AI has been applied in the field of natural language processing to develop intelligent chatbots and virtual assistants that possess the ability to comprehend and generate human language. The increasing focus and escalating usage of AI in educational settings have given rise to the research field known as " AI in education," or AIED. AIED encompasses the application of AI technology in educational environments. It involves using AI to simulate human intellect to infer, judge, forecast, and make decisions related to teaching and learning (Hwang et al., 2020). The primary goal of AI in education is to offer

tailored learning guidance or assistance to individual students, considering their learning progress, preferences, and personal traits (Hwang et al., 2020).

Furthermore, academic writing plays a crucial role in determining students' performance in higher education as it is the assessment that determine the grades (Mujtaba et al., 2023). However, learners face a formidable challenge in attaining academic brilliance when they are required to write in a second language, especially in Malaysia. According to Bartolic et al. (2021), the COVID-19 epidemic has accelerated the use of online technologies in higher education along with the corresponding potential for AI-mediated "machine-to-student" interactions and the academic community has already embraced language-based artificial intelligence. Researchers commonly employ chatbots as research assistants to facilitate thought organization, offer feedback on results of work, assist with code writing, and condense study literature (Hutson, 2022). In addition, the term "adaptive learning system" has attracted a lot of interest recently because it emphasizes improving individual student learning by the modification of different learning system components, including user interfaces, learning content, or learning paths, according to each learner's status (Hwang et al., 2020). The utilization of artificial intelligence systems in language learning has experienced a significant surge in the past decade. This has raised concerns regarding the computers' capacity to assess written text accurately and efficiently (Parra G. & Calero S., 2019). According to Nazari et al. (2021), with the usage of automated writing evaluation (AWE), automated essay scoring (AES), and automated written corrective feedback (AWCF), computer-based applications are being substituted more and more to help with writing. New writing tools powered by AI and accessible through mobile devices have enormous potential to support students in their educational journey and develop writing skills that are difficult to develop through traditional education. Developing autonomous technology that can analyse its environment and carry out activities like a human is one of AI's main goals. By combining the AWE, AES, and AWCF features into a single application, new writing programs may be able to offer customized and time-saving improvements to the writing curriculum. The ease with which anyone, especially undergraduate students, can now use AI has steadily

improved with the tremendous growth in technology. Nevertheless, little study has been done on the use of AI-powered technology as a digital tool to help undergraduate students write better academic papers. As a result, more study is required to determine whether using AI technologies may improve students' writing abilities.

1.2 Research Problems

This research aims to identify the how the utilization of AI tools affects undergraduate academic writing proficiency. According to Tan et al. (2022), the growth in AI will significantly influence the way students' approach and analyze problems, examine many viewpoints, and utilize diverse resources through collaborative and social interactions with their peers. These learning environments necessitate students to cultivate sophisticated abilities within an agency, cognition, social-emotional skills, and behavior to thrive in a knowledge-based society. Moreover, the use of technology may reduce the challenges that have emerged in academic writing because of its growth. Since almost all educational activities now involve technology due to the development of modern technology, studying digital technology is becoming increasingly important. It is the responsibility of software developers to create and execute computer-based programs and applications. The substantial need for technological breakthroughs, such as AWE, AES, and AWCF, has accelerated their development (Nazari et al., 2021). Nowadays, the three computer programs can be combined into one single application known as a digital tool, allowing students to edit, proofread, and arrange their writing all in one place.

Hence, students from different nations are progressively utilizing artificial intelligence technologies to improve their writing procedures. AI writing tools are typically made to evaluate written work and provide comments on a variety of writing-related topics, such as syntax, vocabulary, grammar, content, and structure (Hosseini et al., 2023; Thorp, 2023). This feedback is generated by machine-

learning algorithms that analyze the written text by comparing it to an extensive database of both accurate and inaccurate examples of writing. These tools assist students in recognizing and resolving language problems, while improving the overall clarity and structure of their writings. Furthermore, AI language models like Generative Pre-trained Transformers (GPT), namely OpenAI's ChatGPT, along with natural language processing (NLP) technology, can assist students in generating material and offer suggestions for improving sentence structures and choosing vocabulary (Marzuki et al., 2023). According to Grassini (2023), In recent months, the focus of discussion has mostly centered on Generative Pre-trained Transformer (GPT) models, namely because of the introduction of OpenAI's ChatGPT. This technology is frequently characterized as a groundbreaking advancement. GPT technology utilizes an extensive collection of publicly available digital content data, namely in the field of natural language processing. It uses this data to produce writing that closely imitates human writing and may exhibit creativity over a broad spectrum of topics. GPT models have the capacity to engage with clients in a manner that closely mimics human interaction. These models have been efficiently employed to do numerous job tasks, primarily as chatbots for customer assistance. OpenAI has developed ChatGPT, an advanced technology that seeks to enhance automated conversations and eliminate the requirement for human operators.

Furthermore, authoring tools, such as AWE or AES, were originally developed to assist lecturers in assessing their students' papers. Nevertheless, because to the progress in AI technology, these tools have experienced a substantial transformation. They have transitioned from only verifying grammar and spelling to offering extensive support in identifying writing problems and providing recommendations to improve the work's quality (Alharbi, 2023). One example is Quillbot, a highly popular AI tool for paraphrasing that is available for free. The system offers various grammatical representations, and its approach integrates deep learning with other methodologies for natural language processing. The primary purpose of this tool is to rephrase the text, ensuring that it does not contain any plagiarized content.

Additionally, it aims to shorten long sentences and improve structure to obtain a higher level of accuracy and a more refined overall presentation (Fitria, 2021).

As mentioned above, academic writing is a complex and challenging type of writing that requires students to use critical thinking and display great writing skills (Lin & Morrison, 2021), and practicing academic writing is essential since it is a fundamental component of English language learning and is relevant to the study of any subject where English is the universal language. Similarly, university students in Malaysia face ongoing challenges in understanding the unique and specific academic requirements in their writing practice, as well as adapting to the appropriate academic criteria for their written assignments (Kurniati & Fithriani, 2022). According to Maamuujav et al. (2021), In some countries, like the United States, the teaching of academic writing covers the period from sixth to twelfth grade, with the goal of improving students' advanced skills in analytical writing and their competency in academic language. As a result, they have set a challenging goal for children to produce precise, logical, and advanced written material from an early age. Malaysia also enforces comparable laws; nevertheless, the act of academic writing is primarily assigned to students in tertiary education. These duties usually involve complex and specialized work, such as academic articles, international conferences, proposals, and theses.

In conclusion, the aim of this research is to determine the correlation between the factors that influence independent variables, such as feedback mechanisms, frequency of usage, hedonic motivation, and personalized learning of AI tools, and the resulting impact on the academic writing proficiency of undergraduate students. The research aims to identify the factor that have a significant impact on the academic writing proficiency of undergraduate students in order to have a better understanding of the usefulness and efficiency of AI technologies.

1.3 Research Objective

The objective of this research is to examine the factors of AI tools that impact the academic writing proficiency of undergraduate students in Malaysia.

1.3.1 General Objectives

The main objective of this research is to analyze and understand the influence of utilizing artificial intelligence (AI) tools on the writing proficiency and overall academic performance of undergraduate students.

1.3.2 Specific Objectives

The specific objective of this research is to examine the correlation between the factors influencing the utilization of AI tools and the effect it has on the academic writing proficiency of undergraduate students as shown below:

I: To examine the relationship between personalized learning with AI tools and the academic writing proficiency of undergraduate students.

II: To examine the relationship between the feedback mechanisms of AI tools and the academic writing proficiency of undergraduate students.

III: To examine the relationship between the frequency of usage of AI tools and the academic writing proficiency of undergraduate students.

IV: To examine the relationship between hedonic motivation of AI tools and the academic writing proficiency of undergraduate students.

1.4 Research Questions

There are several questions generated in this research and it will be answered as following:

a. What is the relationship between personalized learning of AI tools and the academic writing proficiency of undergraduate students?

b. What is the relationship between feedback mechanism of AI tools and the academic writing proficiency of undergraduate students?

c. What is the relationship between usage frequency of AI tools and the academic writing proficiency of undergraduate students?

d. What is the relationship between hedonic motivation of AI tools and the academic writing proficiency of undergraduate students?

e. Which of the determinants affect the most in respect of undergraduates' academic writing proficiency?

1.5 Hypothesis of Study

Followings are the developed of hypothesis included:

H0: Personalized learning of AI tools has no significant relationship with the impact on undergraduates' academic writing proficiency.

H_1: Personalized learning of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

H0: Feedback mechanism of AI tools has no significant relationship with the impact on undergraduates' academic writing proficiency.

H_1: Feedback mechanism of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

H0: Usage frequency of AI tools has no significant relationship with the impact on undergraduates' academic writing proficiency.

H_1: Usage frequency of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

H0: Hedonic motivation of AI tools has no significant relationship with the impact on undergraduates' academic writing proficiency.

H_1: Hedonic motivation of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

1.6 Significance of Study

The purpose of the research is to enhance understanding of the influence of AI tools on the academic writing proficiency of undergraduate students in Malaysia. This research will eventually provide advantages that enhance the effectiveness of utilizing AI tools in academic writing.

Currently, students are commonly labelled as "digital natives" due to their innate understanding and ease with technology. As digital natives, students possess digital abilities that allow them to effectively utilize technology resources, particularly for academic writing in English (Ali & Elnadeef, 2023). The study conducted by Hajimaghsoodi & Maftoon (2020) found that the utilization of technological tools for writing has facilitated the advancement of students' writing skills, while also integrating with educational curriculum. Moreover, the study conducted by Faisal & Carabella (2023) demonstrated that utilizing technology for academic reasons enhances students' proficiency in utilizing technological tools for their English writing. Students also perceive technology tools as beneficial for enhancing their English writing experience due to its capacity to facilitate easy editing and

collaboration (Kurniati & Fithriani, 2022). Therefore, students can effectively employ AI and technology for English academic writing. As said students are more technological proficient in searching for various alternatives of AI tools to obtain the best result in completing their academic writings.

Hence, the research aims to study how undergraduate students in Malaysia perceived AI tools and how they utilize these tools in improving their academic writing proficiency by collecting responses from around 200 participants. By collecting these results, a better understanding of the effectiveness of AI tools on academic writing and the factors contributing to the enhancement can be shown. Moreover, the advantages and disadvantages of the expanding use of AI tools can be shown.

1.7 Conclusion

Chapter 1 has presented a summary of the study on AI tools and the variables that influence the academic writing skills of undergraduate students in Malaysia. It also provides a vital framework for the future advancement of the research. Therefore, Chapter 2 will examine the relevant studies that will offer a more comprehensive understanding and clear representation of the entire research.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In Chapter 2, the literature relevant to the study will be shown and will be focusing on reviewing the factors of AI tools that impact the academic writing proficiency of undergraduate students in Malaysia. This chapter comprises four sections that specifically examine the factors that impact undergraduates' academic writing proficiency with the use of AI tools. The initial section focuses on investigating the dependent variable, which is the academic writing proficiency. This is then followed by an examination of four independent variables (feedback mechanism, personalized learning, usage frequency and hedonic motivation). The next section will consist of the relevant theoretical framework and followed by the proposed conceptual framework and hypotheses that will be explored in the research.

2.1 Review of Literature

2.1.1 Artificial Intelligence Tools and Academic Writing

Academic essay writing is a methodical process that integrates comprehensive research, structured argumentation, and specific expression to contribute to academic discussion (Altmäe et al., 2023). In order to establish a solid foundation for excellent writing, students must actively educate themselves in fundamental principles that are crucial to academic writing. This involves creating concise and clear titles that capture the key components of the work, along with generating appealing abstracts that effectively define the primary concepts, methodology, and conclusions of the study. Engaging in academic writing in English is a diverse and vital

effort that presents difficulties for both native and international students (Campbell, 2019) and practicing academic writing is crucial as it is considered an essential aspect of learning English and is applicable to the study of any subject where English is the global language (Kurniati & Fithriani, 2022). According to Parra G. & Calero S. (2019), AI has introduced new approaches to language training and assessment in the field of language education. For example, Generative AI (GenAI) and natural language processing (NLP) technology is utilized extensively for both holistic scoring and writing evaluation. GenAI models employ advanced algorithms to gain insights into patterns and generate innovative material, including text, photographs, audio, videos, and code. GenAI tools consist of various apps, including ChatGPT, Bard, Stable Diffusion, and Dall-E (Int Educ Technol High Educ et al., 2023). This model has been trained using a diverse range of texts, including books, journals, and webpages. This training equips the AI with the ability to understand user input, develop suitable responses, and engage in logical conversations on a wide range of topics. This has the potential to support and transform people in various areas of their activities.

AI-powered writing tools can assist in essay construction, writing style and grammar guidance and idea creation. Gayed et al. (2022) showed the positive impact of AI writing tools on students writing proficiency and confidence, where these technologies have proven to be helpful tools for learners, especially by providing immediate feedback and improving writing skills. Nevertheless, Makarius et al. (2020) emphasized the need for further improvements in AI tools to better their understanding of context and effectiveness in different topic areas, while the integration of AI into academic essay writing also raises questions about the responsibility of educators and ethical considerations. According to the study by Su et al. (2022), the impact of AI tools can be advantageous in providing feedback, the guidance of teachers remains essential in fostering critical thinking and creativity. The integration of AI in the creation of academic articles has

become a significant area of interest in higher education as it offers an extensive range of functionalities to aid in the writing process.

According to the example given by the study of Zulfa et al. (2023), the AI tools commonly employed by students in English academic writing include Grammarly, QuillBot, Google Translate, Mendeley, Google Scholar, Paraphraser.io, and much more. The study by Marzuki et al. (2023) shows that AI writing tools, such as Grammarly, QuillBot and Wordtune have been proven to greatly enhance students' writing proficiency. Generative AI in written communication exceeds the functions of basic grammar and spell-checking software. AI language models have demonstrated exceptional ability in producing integrated and relevant text that imitates human writing styles (Brown et al., 2020). These tools utilize advanced algorithms to identify common issues in grammar, punctuation, and structure, and provide suggestions in paraphrasing to improve clarity and style. Riana et al. (2022) conducted a study that showed using Grammarly improved the grammar and punctuation skills of students by analyzing the user's content and provides instant suggestions for enhancing grammar, spelling, punctuation, clarity, engagement, and delivery. This leads to the conversion of the writing process into a beneficial educational engagement. On the other hand, QuillBot is an AI program that specializes in paraphrasing to help students avoid plagiarism while maintaining the original meaning of their writing. Kurniati & Fithriani. (2022) discovered that QuillBot enhanced student's ability to paraphrase, a vital skill in academic writing. Moreover, WordTune focuses primarily on improving and optimizing the tone and style of the text. Lam & Moorhouse (2022) conducted a study that showed WordTune's effectiveness in helping students identify their writing weaknesses, thereby promoting self-evaluation and learning. This tool goes beyond simple grammatical correction and explores into the styles of writing. The language model technology, GPT-3, developed by OpenAI, has the ability to generate logical and contextually relevant statements, hence augmenting students'

creative and analytical thinking (Mhlanga, 2023). It acts as a helpful tool for students to investigate different writing styles and themes.

According to Alharbi (2023), AI-powered technologies provide significant support in various parts of academic writing, including language correction, grammar verification, and editing. They can assist students in identifying and resolving language problems, therefore enhancing the overall clarity and coherence of their writing. A study shown by Marzuki et al. (2023) states that AI language tools, such as GPT-3, can aid students by producing content and offering recommendations to enhance sentence structures and select suitable vocabulary. Whereas Sharifi et al. (2021) showed that AI-powered citation and reference management systems like Mendeley enables students to effectively organize and arrange reference lists accurately, while ensuring compliance with various citation guidelines. In addition, AI-powered solutions such as plagiarism detection software help students maintain academic integrity by identifying potential plagiarism and improves students' ability to complete literary reviews more efficiently. AI-powered search engines and databases also can optimize the process of finding research papers and can offer customized recommendations based on user preferences and previous search behaviors (Chichekian & Benteux, 2022).

2.1.2 Personalized Learning with AI Tools

According to Bhutoria. (2022), personalized learning systems, as exemplified by adaptive learning platforms and intelligent tutoring systems, represent a prominent and valuable application of artificial intelligence in the realm of student and teacher support. Based on the study conducted by Vincent-Lancrin & Van Der Vlies. (2020), the primary advantage of AI in education is its ability to personalize instruction and learning resources.

Personalized learning is an educational strategy that tailors the learning experience to match the specific requirements and strengths of each learner. AI tools can recognize educational materials and methods that are suitable for each student's level. They may also use data from individual students to generate predictions, recommendations, and decisions regarding the next steps in the learning process. AI technologies facilitate learners in acquiring mastery of the subject at their individualized speed and offer teachers recommendations on how to support them. The study of Int Educ Technol High Educ et al. (2023) shows that AI can also offer customized educational materials to cater to the specific requirements of students.

Moreover, Fitria (2021a)'s study shows that the AI system will gather data from user learning activities and thereafter offer alternate learning solutions tailored to individual user requirements and facilitates individual student progress and development based on their unique pace and aptitude in studying the topic, while aligning with their personal preferences and talents. AI will additionally offer material suggestions, alert the user about their study timetable, and do numerous other crucial functions. AI will acquire the ability to optimize users' learning methods, hence enhancing the effectiveness and efficiency of the learning process. Furthermore, Tapalova & Zhiyenbayeva. (2022) showed that personalized learning systems help to analyze the mastery of the abilities, present students with the finest educational activities and motivate students to learn at their own speed as they master skills and advance toward learning goals. AI permits the employment of multiple teaching methods effective for each student, considering the strengths, shortcomings, abilities, and academic challenges of each learner. Walkington & Bernacki (2020) defines personalized learning in AI tools as a methodical approach to education that tailors the learning experience to match an individual learner's unique strengths, preferences, needs, and goals. It facilitates a comprehensive learning experience by providing a diverse range of new disciplines and opportunities for skill development and inspire students to engage in

learning and writing, and enhance their academic achievements (Zlatarov et al., 2021). According to the study of Das et al. (2023), the personalization learning of AI tools has the benefit which can tailor learning experiences of students and have the potential to improve academic performance and understanding of educational goals in writing and by catering to the unique learning requirements of each student, they are more inclined to achieve their maximum capabilities in their academic abilities. Moreover, it can enhance the students' engagement in AI tools as they are able to customize content and activities based on students' interests and preferences enhances their engagement and willingness to learn which results in students having a higher level of commitment to their studies when the content is both pertinent and captivating (Das et al., 2023). Therefore, hypothesis is proposed as followed:

H₁: Personalized learning of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

2.1.3 Feedback Mechanism of AI Tools

According to Nazari et al. (2021), one significant impact of AI in education and meaningful learning is the provision of prompt feedback to students regarding their learning progress. The study also shows that to promote active participation from students and enhance their academic performance, motivation, and ability to regulate their own learning, it is crucial to provide prompt and timely feedback. AI learning tools may effectively enable and assist this promptness. The feedback facilitated the students' increased engagement, development of knowledge, active participation, and autonomy. The immediate and ongoing feedback, along with concrete and educational illustrations, offers learners enhanced opportunities for tailored and individualized experiences and instructional feedback can improve writing skills, problem-solving abilities, and self-regulatory methods (Nazari et al., 2021). The study by Burkhard (2022) shows that AI-driven tools enhance

analysis and enable learners to identify and rectify their writing mistakes by offering instant ideas and fixes in real time and students increasingly depend on word processors and other text editing technologies to finish their written coursework. These services offered learners access to elementary grammar and spelling checks, which they could utilize to enhance their work. Li (2023) stablished an artificial intelligence-driven peer evaluation mechanism for preliminary versions of essays in a university-level writing class. The investigation unveiled that student valued the prompt feedback provided by the AI system, facilitating their enhancements prior to submitting their concluding essays.

According to the research made by Shi & Deng (2023), the AI feedback mechanism's presenting styles are crucial elements in their determining their effectiveness and how will it be perceived by users. The four prevalent presenting styles for AI feedback are text, graphic, tabular review, and speech. Various factors can influence consumers' preferences for AI feedback presenting styles. Based on the findings of Stein et al. (2020), one key aspect is simplicity. Individuals generally have a stronger aversion towards artificial intelligence that utilizes sophisticated algorithms compared to simpler ones and some people regard complex algorithms as "eerie and highly unnatural," which they consider a danger to the distinctiveness of human beings. The study also shows that images and text-based feedback prove to be more efficacious than the other tabular and speech, since they offer a more direct and uncomplicated approach. While on the other hand, another aspect to consider is the level of transparency in the presentation, as shown in the study by Litterscheidt & Streich (2020), where it indicates that algorithms could potentially gain advantages by revealing the inner workings of their processes, sometimes referred to as the "black box". When AI offers further insights into the decision-making process, including the reasons considered and providing basic explanations for its conclusions, individuals are more likely to regard it as being reliable (Litterscheidt & Streich, 2020). Moreover, the study of Mahmud et al. (2022)

pointed out the fact where the level of familiarity individuals has with algorithms, tasks, and AI presentation styles can significantly impact their decision-making process in utilizing the tools as unfamiliarity with AI often leads to increased wariness among individuals.

Furthermore, AI writing assistants have advanced into potent instruments for facilitating the exchange of knowledge by offering prompt, automated, and resolving feedback (Sundaresan & Zhang, 2022) and they have been demonstrated to be effective in enhancing the quality, precision, shareability, and overall efficiency of writing (Ippolito et al., 2022; Shi & Deng, 2023). The study of Swargiary (2023) identifies few of the functions of AI tools which contributes to the usefulness of the AI tools' feedback mechanisms in supporting academic writing. Examples given were automatic speech recognition and language translation that can rapidly convert written text into multiple languages. Zhao (2022) has shown that the incorporation of numerous widely used word processing applications that have speech recognition capabilities enables users to verbally communicate into a microphone and have the computer convert their words into text. Although certain speech recognition programs still have room for enhancement, they are progressively becoming more intricate and sophisticated compared to their prior iterations. Next is proofreading and automated editing where its functions to rectify grammar problems in academic essays or any writings (Miranty & Widiati, 2021). One of the most widely used functions of AI tools is plagiarism detection as this software has the capability to identify instances of plagiarism in a wide range of fields and industries, such as publishing, media, academia, visual art, and design, as well as source code for computer programs and development (Utami et al., 2023). Lastly, more rapid and responsive feedback loops lead to an enhancement in student accomplishments as students follow a prescribed set of principles when it comes to learning. The greater the number of positive feedback loops provided for student writing, the higher the likelihood that the student will

acquire the fundamental abilities targeted by those feedback loops (Koka et al., 2023).

The following are a few of the examples of the mostly used AI tools in academic writing: Miranty & Widiati (2021) examined Grammarly's influence on the writing proficiency of undergraduate students. The study found that students who used Grammarly showed improvements in overall grammatical clarity and quality of their academic writing. AI language models, like ChatGPT, have been investigated for their ability to assist students in developing content. Farrokhnia et al. (2023) and Rospigliosi (2023) conducted a study where ChatGPT was utilized to assist undergraduates in generating research ideas. The results indicated that the content provided by the AI was helpful in providing initial concepts of writing and structuring the recommendations. However, it also required additional improvement and elaboration from the students. Therefore, hypothesis is proposed as followed:

H$_2$: Feedback Mechanism of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

2.1.4 Usage Frequency

According to the study of Parra G. & Calero S. (2019), AI has demonstrated its efficacy in addressing intricate challenges across diverse fields, including the field of education. The utilization of artificial intelligence (AI) in the domain of natural language processing has led to the development of sophisticated chatbots and virtual assistants that possess the ability to comprehend and generate human language. This has enabled the overcoming of temporal constraints and the expediting of the feedback process. Enabling students to cultivate their writing proficiency at their individualized speed can enhance their independent engagement and

involvement within the language classroom. Moreover, the tool's ability to assess the students' writing performance in a consistent and objective manner encourages learners to enhance their writing mechanics and accuracy. The utilization of artificial intelligence systems in the language learning process has experienced significant growth over the past decade and shown to be widely used by students.

The research investigating the correlation between the frequency of AI utilization and student academic performance is unclear. Yildiz Durak (2023) research on 86 university students in Turkey found no connection between the frequency of AI tools usage and factors such as visual design self-efficacy, course satisfaction, chatbot usage satisfaction, and learner autonomy. The discovery demonstrates that the mere frequency of use is not a significant determinant, rather user pleasure can influence users' self-effacement. Contrarily, Bailey et al. (2021) discovered a positive correlation between the duration of chatbot usage in a second language writing class and students' confidence in utilizing the target language as well as their opinion of the importance of the assigned tasks.

Hence, further study is needed to determine whether frequency usage of AI tools will have a positive relationship with the effectiveness of AI tools on academic writing proficiency. Therefore, hypothesis is proposed as followed:

H₃: Usage Frequency of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

2.1.5 Hedonic Motivation

Hedonic motivation pertains to the extent to which students consider the utilization of AI tools for academic objectives as enjoyable, engaging, and

stimulating (J. K. M. Ali et al., 2023). Prior studies in the domain of e-learning have confirmed that the acceptance of novel learning tools is impacted by hedonic motivation. Online learners are more likely to seek for stimulating, pleasurable, and advantageous courses that demonstrate expertise, engagement, and well-organized content. The interactive and dialogic aspect of AI Tools holds the capacity to augment pleasure and entertainment. Tools like ChatGPT provides users with an enjoyable experience, even if it is only available as a digital application. Its capacity to generate responses that mimic human writing is its distinguishing feature (Foroughi et al., 2023).

Aside from its practical advantages, the satisfaction and joy that students experience when using AI tools serves as a noteworthy source of motivation. According to the study by J. K. M. Ali et al. (2023), students are more likely to include AI tools into their academic routines when their interactions with it are both stimulating and rewarding. The tool's hedonic attraction is heightened by its ability to offer a novel and dynamic learning experience, beyond its functional constraints. Students, who often face the difficulties of higher education, appreciate a tool that not only achieves educational goals but also enhances their learning experience with a sense of delight. The novelty of engaging with a language model like ChatGPT, along with the potential for creative and interactive conversations, enhances its incentive driven by pleasure. In an educational setting where traditional learning methods can sometimes get monotonous, the introduction of a technology that not only aids in academic tasks but also provides an enjoyable and intellectually stimulating experience can be greatly appreciated. The increasing demand for tools that align with students' individual preferences and improve the learning process has led to the recognition of hedonic motivation as a crucial factor (Zhao et al., 2022).

There has been a rise in the need for excellent academic and non-academic (administrative) support services to aid students in their studies and foster their enthusiasm for learning (Zhao et al., 2022). By using AI tools, the

development of an ideal educational setting for students can be improved through the provision of prompt and precise information, reducing administrative challenges, and presenting a cost-effective alternative for higher education institutions. Furthermore, previous studies have established a clear correlation between the use of chatbots and online chatting systems and the improvement of student engagement in higher education institutions (Abbas et al., 2022). The constructivist perspective on learning highlights the significance of active learning, wherein learners engage actively in their own learning process rather than acquiring knowledge passively. Therefore, hypothesis is proposed as followed:

H4: Hedonic Motivation of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.

2.2 Review of Relevant Theoretical Model

2.2.1 The ARCS Model of Motivational Design

The ARCS model of motivation, as developed by Keller (2009), consists of four key components: Attention, Relevance, Confidence, and Satisfaction. Initially, it is crucial to capture the learners' attention and ensure their active involvement in the learning process. The second component pertains to the necessity of relevance for the learners and their experiences. Additionally, there is a component of confidence that is associated with the anticipation and enthusiasm of the learner. Ultimately, when learners have a favorable influence on the learning process, it will enhance their satisfaction level, hence increasing their drive (Keller, 2009). The primary goal is to support the development of curriculum or enhance teaching methods by focusing on four key factors that aim to inspire students' motivation and facilitate their learning process. The model has categorized the teaching and learning processes into two primary inputs and one resulting output. The inputs

consist of individual attributes and contextual factors, whereas the output includes the level of exertion, achievement, and subsequent outcomes. The interplay between personal qualities and environmental factors creates a dynamic system that impacts the learners' physical effort, achievement, and outcomes (Chang et al., 2018). When teaching designers focus on stimulating learners' interest, strengthening students' confidence, and improving learners' happiness with their learning results, it will motivate learners to work more and create a positive cycle of improvement. This study therefore modified the existing model and implemented it with different hypothesis in the context of use of AI tools in improving academic writing proficiency.

Figure 2.2.1 Research Model adapted from Keller (2009).
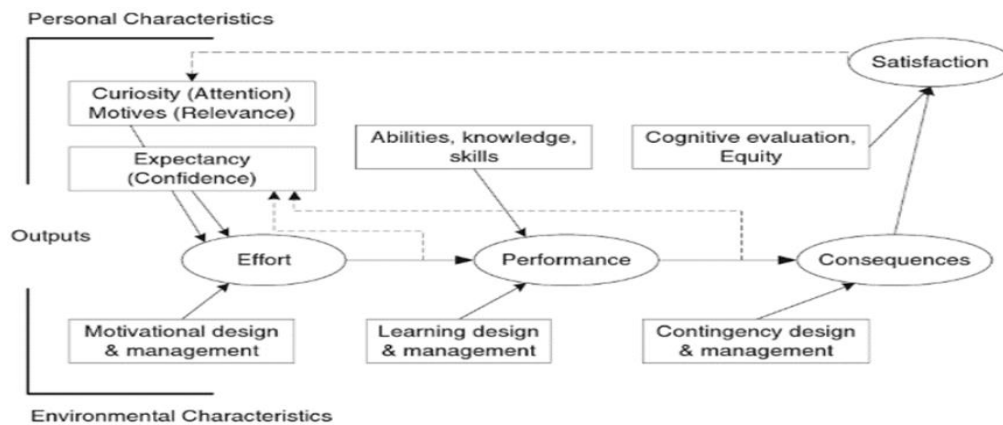
2.3 Proposed Theoretical/ Conceptual Framework

Figure 2.3.1 Conceptual Framework of the research
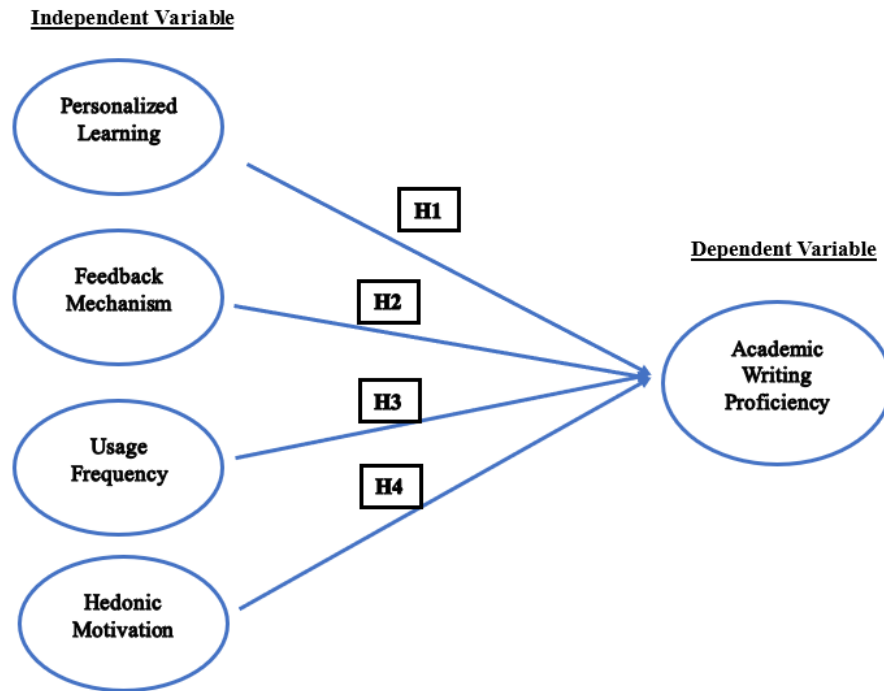
The diagram shown above illustrates the conceptual framework, which refers to the concept of The ARCS Model of Motivational Design. It is used to examine the correlation between dependent and independent variables in the research.

1. Attention: The Attention component of the ARCS model focuses on capturing learners' interest and engagement. personalized learning can be designed to grab students' attention by tailoring the content to their individual needs and preferences. This personalization can enhance students' focus and interest in the writing tasks, ultimately improving their engagement and motivation to write.

2. Relevance: Relevance emphasizes the importance of making the learning content meaningful and applicable to learners' goals. Feedback mechanisms play a crucial role in providing students with relevant information about

their writing performance. By receiving personalized feedback on their writing, students can better understand their strengths and areas for improvement, making the writing tasks more relevant and purposeful.

3. Confidence: Confidence in the ARCS model relates to building learners' self-assurance and belief in their abilities. Usage frequency of writing tasks can contribute to students' confidence by providing them with regular practice opportunities to hone their writing skills. As students engage more frequently with writing tasks and receive constructive feedback, their confidence in their writing abilities is likely to increase.

4. Satisfaction: Satisfaction focuses on ensuring that learners feel a sense of accomplishment and fulfilment from their learning experiences. Hedonic motivation, which refers to the pleasure and enjoyment derived from an activity, can enhance students' satisfaction with academic writing tasks. By incorporating elements that make writing enjoyable and rewarding, such as gamification or interactive features, students are more likely to feel satisfied with their writing experiences and motivated to continue improving.

CHAPTER 3: RESEARCH METHODOLOGY

3.0 Introduction

This chapter will be covering various types of methods that have been applied in our study such as research design, methods of collecting data, sampling data, design instrumental, way of constructing a measurement for our research, data analysis, as well as data processing.

3.1 Research Design

A research design is a structured framework that allows researchers to assure the validity of the evidence acquired during a marketing research study. It outlines the essential procedures for obtaining the necessary information to develop or analyze marketing research problems. Therefore, this research has utilized quantitative and descriptive conceptual research.

3.1.1 Quantitative Research

Quantitative research is the gathering, analysis, and numerical representation of structured data. This research states and verify the causal relation between the variables. It was used to identify the influence of personalized learning, feedback mechanism, usage frequency and hedonic motivation on the effects of AI tools on undergraduates' academic writing proficiency. Through this research, it able to show which of the independent

variables have the most significant impact towards the effects of AI tools on undergraduates' academic writing proficiency.

3.1.2 Descriptive Research

This study employed descriptive research methodology. In Section A of the questionnaire, demographic profiles were utilized to characterize a population about significant variables. Descriptive research studies aim to interpret the features of a certain population, including their background and personal information, to understand groups of individuals or organizations.

3.2 Data Collection

Two sources of data were utilized for the study, which are primary and secondary data. The collection of primary data was conducted by gathering first-hand information which are relevant to the research study.

3.2.1 Primary Data

In this study, primary data is the raw information acquired from the first-hand sources that collected by researcher. The purpose of collecting primary data is to get related information that required by the study objectives. Besides, collecting primary data is essential in discovering the information about the aspects which would influence undergraduates' academic writing proficiency by utilizing AI tools. Hence, in this research by collecting

primary data, survey questionnaires have been distributed as it is simple and convenience yet dependable.

3.3 Sampling Design

3.3.1 Target Population

Target population refers to the group of individuals that are eligible and have the qualification for the study's data analysis. The population targeted are undergraduates, which are students currently studying for a degree in university. The targeted age range is between 20 to 25 years old, which is the average age of university students pursuing a degree. The reason for selecting undergraduates as the target population is because they have potential to be more exposed to AI tools in their academic writing process. Hence, this will improve the reliability of the results obtained.

3.3.2 Sampling Location

In order to simplify the process of data collection, the survey questionnaires are distributed in different universities in Malaysia and the distribution is carried out through online method by sharing with universities students on communication platforms like Instagram and WhatsApp and also distributed to them face-to-face. Universities are selected as most university's students and undergraduates can be found there and the location ease availability to interact with the targeted population.

3.3.3 Sampling Frame and Element

A sampling frame is a comprehensive list or representation of the entire population from which a sample will be selected (Mweshi & Sakyi, 2020). In this research, the respondents who participated in the questionnaire are the sampling element. The sampling element for this study include all undergraduates who aged between 20 to 25 years old. The objective of the research is to examine the effects of AI tools on the academic writing proficiency of undergraduates. Hence, any undergraduates who had experience with AI tools are qualified as the potential respondents.

3.3.4 Sampling Technique

A sampling technique is a research methodology employed to choose a smaller group of individuals from a broader population for the investigation. This study utilized non-probability sampling, where researchers select their sample elements without relying on a predetermined probability and conducted without knowing if the individuals chosen in the sample are a true reflection of the overall population. (Mweshi & Sakyi, 2020). Participants with age range of 20- to 25-year-old are intended to be approached as they are most likely to be undergraduates targeted for the study. In contrast, convenience sampling is chosen for the sampling technique for the study. According to Mweshi & Sakyi (2020), a convenience sample consists of individuals who are readily available to the researcher and can provide the desired information. Moreover, it is an inexpensive yet convenient method, but it is uncertain whether it is able to produce generalized result representing the whole population. Hence, it is important to study the effect of AI tools on undergraduates academic writing proficiency as different individuals might have different level of exposure to AI tools or technology.

3.3.5 Sampling Size

According to Lakens (2022), the following rules of thumb are proposed to determine sample size which the sample sizes that larger than 30 and less than 500 are appropriate for most of the research. In order to attain a stable solution through factor analysis, a total of 200 respondent will be selected as the sample size for the research.

3.4 Research Instrument

Research instruments are the tools utilized by a researcher to gather data and information in a research study. Furthermore, it has been designed to analyze factors, collect responses from participants, and streamline the process of data selection and analysis. The research focuses on investigating the effects of AI tools on the academic writing proficiency of undergraduate students. The research instrument used in the study is self-administered questionnaire, and Google Form is utilized as a mean of designing, delivery and collecting the results of the questionnaire. The respondents will answer the questionnaire either through online or face-to-face methods.

3.4.1 Questionnaire Design

A straightforward and understandable structured questionnaire was developed for this study. A brief introduction of the research was explained at the cover page of the survey questionnaire. In addition, the survey questionnaire consists of four (4) sections which are Section A, B, C and D. Section A are the general questions regarding the demographic information

of the respondents, which normally includes the gender and education level of the respondents.

Moreover, Section B consists of the general questions regarding AI tools and their applications. Section C and D consists of core questions that are used to determine the significance of each independent variables with the dependent variables. Construct measurements are recorded through a 5-Point Likert scale, where each respondent is required to select a rank among the 5 options depending on their satisfaction and preference to represent their viewpoint. The measurement scale comprises a series of statements, each linked to a collection of response possibilities ranging from "strongly disagree" to "strongly agree".

Table 3.4.1 Summary of Measures

Variable	Number of Items	Measurement Scale
Personalized Learning	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Feedback Mechanism	5	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Usage Frequency	5	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Hedonic Motivation	5	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)
Academic Writing Proficiency	4	5-Point Likert Scale (1=Strongly Disagree to 5=Strongly Agree)

Source: Developed for the research

3.4.2 Pilot Test

The key phase in a research study is the pilot test, which serves to detect potential areas of concern and flaws in the research instruments. The purpose of doing a pilot test is to enhance the questionnaire to ensure the validity and reliability of the collected data. In addition, it can assist in identifying issues such as grammatical flaws, spelling mistakes, and other errors. In the present study, a total of 30 sets of questionnaires were distributed among the chosen participants for obtaining a comprehensive review of the questions. The Statistical Package for Social Science (SPSS) was utilized to conduct a reliability test. The pilot test was assessed using Cronbach's Alpha, and the results are presented below.

Table 3.4.2 Pilot Testing Result

Constructs	Number of Items	Cronbach's Alpha
Personalized Learning	4	0.661
Feedback Mechanism	5	0.782
Usage Frequency	5	0.888
Hedonic Motivation	5	0.888
Academic Writing Proficiency	4	0.849

Source: Developed for the research

3.5 Construct Measurement

3.5.1 Origin of Construct

Construct	Sources
Academic Writing Proficiency	• (Mahapatra, 2024)
Personalized Learning	• (Malik et al., 2023) • (Miranty & Widiati, 2021)
Feedback Mechanism	• (Malik et al., 2023) • (Miranty & Widiati, 2021)
Usage Frequency	• (Malik et al., 2023) • (Miranty & Widiati, 2021)
Hedonic Motivation	• (Malik et al., 2023) • (Miranty & Widiati, 2021)

Source: Developed for the research

3.5.2 Data Scale of Measurement

3.5.2.1 Nominal Scale

A nominal scale is employed to assign labels and highlight variables that lack any quantitative value. The gender of the respondents in Section A is effectively represented using a nominal scale, which consists of two categories: male and female.

3.5.2.2 Likert Scale

However, Section B consist of information used to identify the general option of respondents on the constructs. This section employed a 5-point Likert scale. An ordinal scale ranging from 1 to 5 representing Strongly Disagree to Strongly Agree is engaged to understand the extent to which the respondent resonate with the questions.

3.6 Data Processing

Data processing refers to the process of preparing data for research purposes. This involves activities such as reviewing responses, editing, coding, transcribing, and cleaning the data to ensure its reliability and precision. Prior to data processing for data validation, the researchers must ensure that all survey questionnaires have been filled out by the respondents.

3.6.1 Data Checking

The questionnaire involves a process of examination and identification to determine whether there are any errors present, such as issues with question flow, content, spelling and grammar, and other related aspects. The purpose is to guarantee the quality of the study data and ensure that the respondents understand the questionnaire.

3.6.2 Data Editing

Data editing will be conducted upon identifying any errors before the data is transformed into information that can be considered as accurate. Subsequently, any incomplete responses will be eliminated from the collected data. In addition, data editing contributes to maintaining the research's standard by minimizing errors.

3.6.3 Data Coding

In the process of data coding, it is necessary to standardize and convert the data into numerical form. A sequential number will be assigned to categorize all the categories in the surveys. For instance, in Questionnaire Section B, the range of responses from strongly disagree to strongly agree can be assigned numerical codes from 1 to 5 to indicate the level of agreement with the statement.

3.6.4 Data Transcription

The objective of data transcription is to analyze the data by using SPSS software. Once the data has been imported into the SPSS software, it will process the data and produce a reliable outcome.

3.6.5 Data Cleaning

The purpose is to validate the accuracy of the data and input from the questionnaire into the SPSS software. In addition, the presence of inconsistencies in the data will reduce the level of accuracy. Hence, in this study, data cleansing is vital to thoroughly inspect and maintain the integrity of the obtained data.

3.7 Data Analysis

Data analysis is the systematic process of describing, illustrating, condensing, recapping, and evaluating data using statistical or logical techniques. An inaccurate statistical analysis can lead to misunderstandings among readers. Therefore, SPSS is utilized to assess the reliability, significance, descriptive analysis, and accuracy of data measurements.

3.7.1 Descriptive Analysis

The process of examining and summarizing data in order to gain a better understanding of its characteristics and patterns. Descriptive analysis is the conversion of raw data into a format that researchers can readily comprehend and assess. Furthermore, descriptive analysis also furnishes comprehensive information regarding the characteristics of the population under study. Additionally, it encompasses the distribution of frequencies, measures of central tendency (such as the mean, mode, and median), and measures of dispersion (including the range, variance, and standard deviation).

3.7.2 Scale Measurement

Scale measurement is employed to assess the dependability and accuracy of the questionnaire. The reliability test was performed using SPSS in this study.

3.7.2.1 Reliability Test

The reliability test is a quantitative assessment that measures the degree of stability and consistency of the study construct. In addition, researchers employ Cronbach's Alpha, a statistical measure that indicates the level of consistency and reliability of a variable. A higher coefficient value indicates a greater degree of consistency and reliability.

Table 3.7.2.1 Range of Cronbach's Alpha Value

Coefficient Range	Strength of Association
< 0.6	Low
0.6 to < 0.7	Moderate
0.7 to < 0.8	Relatively High
0.8 to < 0.9	Reliable
> 0.9	Excellent

Source: (Taber, 2017). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education

3.7.3 Inferential Analysis

Inferential analysis is the process of drawing conclusions or making predictions based on available data. In this research, inferential analysis is employed to ascertain the validity of the hypothesis by quantifying the correlation between the variables.

3.7.3.1 Multiple Regression Analysis

Multiple regression analysis is a statistical technique employed to examine the linear association between a dependent variable and several independent variables. In addition, it aids researchers in determining the presence of a relationship between the dependent variable and the four independent factors. Furthermore, multiple regression analysis is suitable for implementation when all dependent and independent variables can be measured using the same scale. Additionally, the ANOVA test results, and coefficient value will be conducted at the conclusion of the analysis test.

The formula of multiple regression analysis:

$$Y = a + \beta X1, + \beta X2, + \beta X3 + ... + \beta.X.$$

Whereby,

Y= Dependent variable a= Constant

ß, = Coefficient associated with the independent variables

X, = Independent variables

Equation:

$$YAWP = \beta 1PL + \beta 2FM + \beta 3UF + \beta 4HM$$

Whereby:

AWP = Academic Writing Proficiency

PL = Personalized Learning

FM = Feedback Mechanism

UF = Usage Frequency

HM = Hedonic Motivation

3.8 Conclusion

In short, this chapter provides a brief overview of the research technique. A total of 200 questionnaires will be delivered to the targeted respondents, and all the gathered data will be inputted into the SPSS software for analysis and interpretation. Chapter 4 will provide a detailed analysis of the statistical findings gathered from the data that was collected.

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

The research will utilize SPSS software to analyze and draw conclusions from the acquired data. This chapter will provide a detailed analysis and explanation of the collected data, including the demographic profile and general information of the respondents. This information will be presented in the form of tables and graphs, which will include percentages. Additionally, the chapter will specifically concentrate on the outcomes of reliability tests, as well as each independent and dependent variable in the Multiple Regression analysis and hypothesis testing.

4.1 Descriptive Analysis

4.1.1 Respondents' Demographic Profile

There are total of four (4) questions involved in this section which are gender, age, education level, and race/ ethnicity.

4.1.1.1 Gender

Table 4.1.1.1 Result of Respondent Based on Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Female	101	50.5	50.5	50.5
Male	99	49.5	49.5	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.1.1 Percentage of Respondent Based on Gender
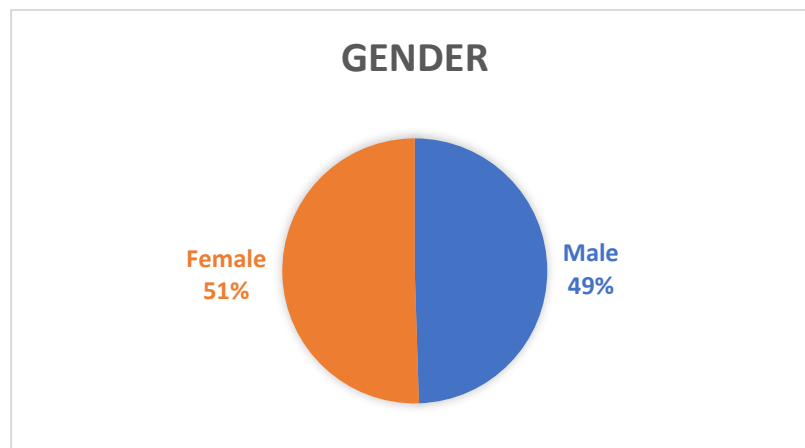
Source: Developed for the research

According to the Table and Figure 4.1.1.1 above, 51% out of the 200 respondents are female, which is equivalent to 101 respondents. Whereas the remaining 49% are males which is equivalent to 99 respondents.

4.1.1.2 Age

Table 4.1.1.2 Result of Respondent Based on Age

	Frequency	Percent	Valid Percent	Cumulative Percent
16 - 19	2	1.0	1.0	1.0
20 - 25	195	97.5	97.5	98.5
26 & above	3	1.5	1.5	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.1.2 Percentage of Respondent Based on Age
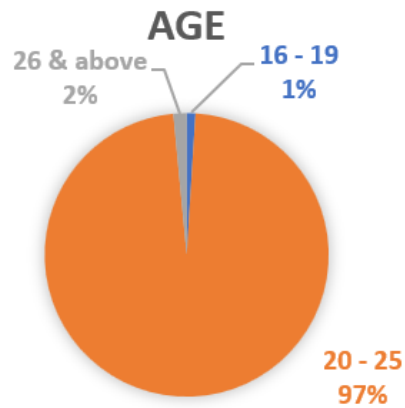
Source: Developed for the research

According to Table and Figure 4.1.1.2, 195 out of the 200 respondents age between 20 – 25 years old (97%). Whereas only 2 respondents age between 16 to 19 years old (1%) and 3 respondents aged 26 years old and above (2%).

4.1.1.3 Education Level

Table 4.1.1.3 Result of Respondent Based on Education Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	2	1.0	1.0	1.0
Postgraduates	2	1.0	1.0	2.0
Undergraduates	196	98.0	98.0	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.1.3 Percentage of Respondent Based on Education Level
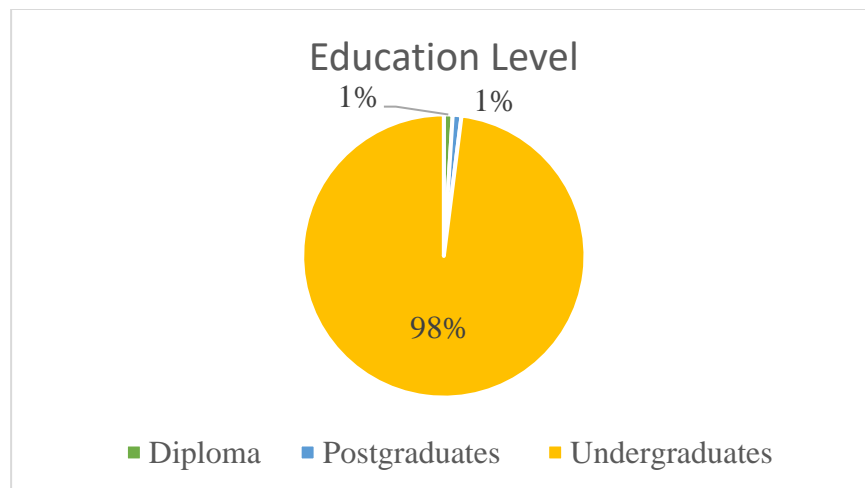
Source: Developed for the research

According to Table and Figure 4.1.1.3, 98% of the respondents are undergraduates, which shows that 196 respondents are currently pursuing a degree in university. On the other hand, there are 2 respondents who are currently postgraduates and 2 respondents who are studying for a diploma.

4.1.1.4 Race/Ethnicity

Table 4.1.1.4 Result of Respondent Based on Race/ Ethnicity

	Frequency	Percent	Valid Percent	Cumulative Percent
Chinese	140	70.0	70.0	70.0
Indian	23	11.5	11.5	81.5
Malay	37	18.5	18.5	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.1.4 Percentage of Respondent Based on Race/ Ethnicity
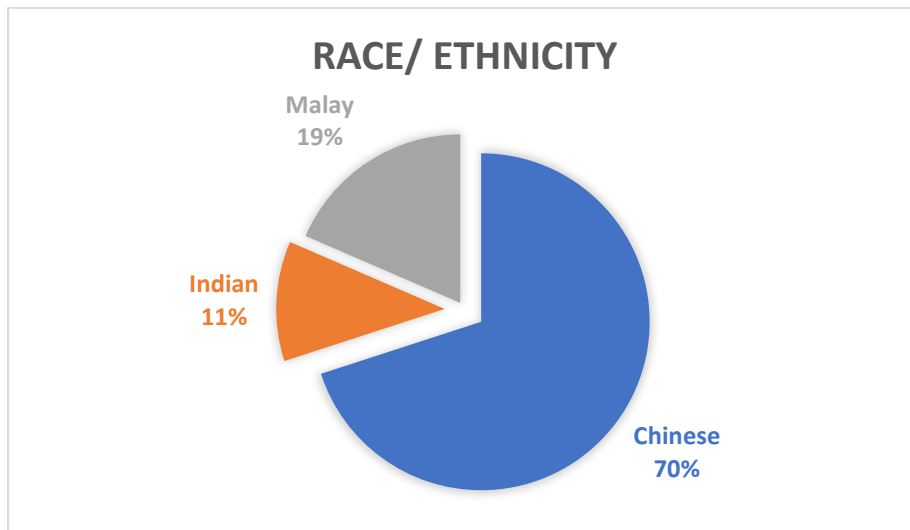
Source: Developed for the research

According to Table and Figure 4.1.1.4, majority of the respondents are Chinese, where they equivalent to 70% (140) of the total respondents. Whereas Malay and Indian respondents hold 19% (37) and 11% (23) of the total respondents.

4.1.2 Respondents' General Information

There are four questions covered in the general information section. The questions including the respondent's level of exposure to AI tools, the tools they used, the purpose of their usage and how often they utilized AI tools in academic studies.

4.1.2.1 What is your level of exposure to Artificial Intelligence (AI) tools?

Table 4.1.2.1 Statistic Result of Respondent's Level of Exposure to AI Tools

	Frequency	Percent	Valid Percent	Cumulative Percent
High	138	69.0	69.0	69.0
Moderate	41	20.5	20.5	89.5
Very High	20	10.0	10.0	99.5
Very Low	1	0.5	0.5	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.2.1 Percentage of Respondent's Level of Exposure to AI Tools
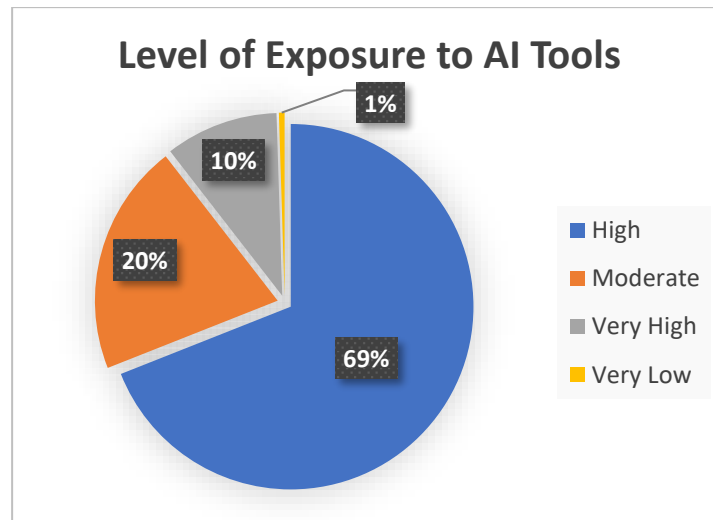
Source: Developed for the research

According to Table and Figure 4.1.2.1, 138 out of 200 respondents (69%) have a high exposure to AI tools and have a general knowledge on what are AI tools and how they function, while 20 respondents (10%) showed that they have very high exposure to AI tools and are more proficient in using AI. On the other hand, 41 respondents (20%) stated that they only have a moderate exposure to AI tools, while only 1 respondent (1%) has a very low exposure to AI tools.

4.1.2.2 Which academic AI tools do you often use?

Table 4.1.2.2 Statistic Result of Which Academic AI Tools Does Respondents Often Use

	Frequency	Percent
Grammarly	139	32.8
ChatGPT	192	45.3
Quillbot	52	12.3
WordTune	3	0.7

Paraphraser.io	38	9.0
Total	424	100.0

Source: Developed for the research

Figure 4.1.2.2 Percentage of Which Academic AI Tools Does Respondents Often Use
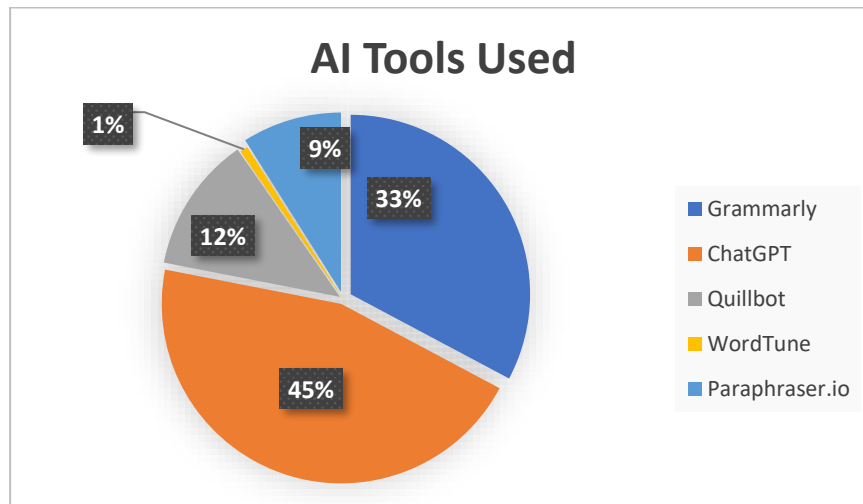
Source: Developed for the research

According to Table and Figure 4.1.2.2, it can be shown that most of the respondents utilized more than one AI tools in their academic studies. The most used AI tools by the respondents in their academic studies is ChatGPT, stated by 192 out of 200 respondents (45%). The second most used AI tools is Grammarly, where 139 out of 200 respondents (33%) showed that they utilized the tool in their academic studies. On the other hand, Quillbot and Paraphraser.io which are both paraphrasing AI tools only accumulated 52 (12%) and 38 (9%) respondents each for their usage of these tools in their academic studies. Lastly, only 3 respondents stated that they utilized Wordtune (3%) in their academic studies.

4.1.2.3 What is the purpose of you using AI tools?

Table 4.1.2.3 Statistic Result of Respondents' Purpose of Using AI Tools

	Frequency	Percent
Entertainment	19	7.8
Academic	195	79.6
Experimental Research	31	12.7
Total	245	100.0

Source: Developed for the research

Figure 4.1.2.3 Percentage of Respondents' Purpose of Using AI Tools
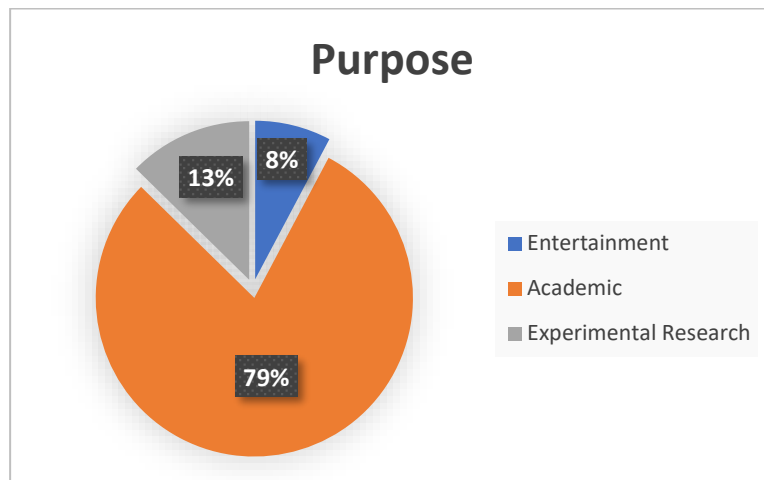
Source: Developed for the research

According to Table and Figure 4.1.2.3, it can be shown that some respondents have multiple purpose in using AI tools. Almost all the respondents (195 out of 200 respondents, 79%) showed that they use AI tools mainly for academic purposes. On the other hand, 31 respondents stated that they also use AI tools for experimental research purposes (13%), while 19 respondents used AI tools for entertainment (8%).

4.1.2.4 How often do you use AI tools in academic studies?

Table 4.1.2.4 Statistic Result of Respondents' AI Tools Usage in Academic Studies

	Frequency	Percent	Valid Percent	Cumulative Percent
Always	28	13.0	13.0	13.0
Often	145	72.5	72.5	85.5
Sometimes	29	14.5	14.5	100.0
Total	200	100.0	100.0	

Source: Developed for the research

Figure 4.1.2.4 Percentage of Respondents' AI Tools Usage in Academic Studies
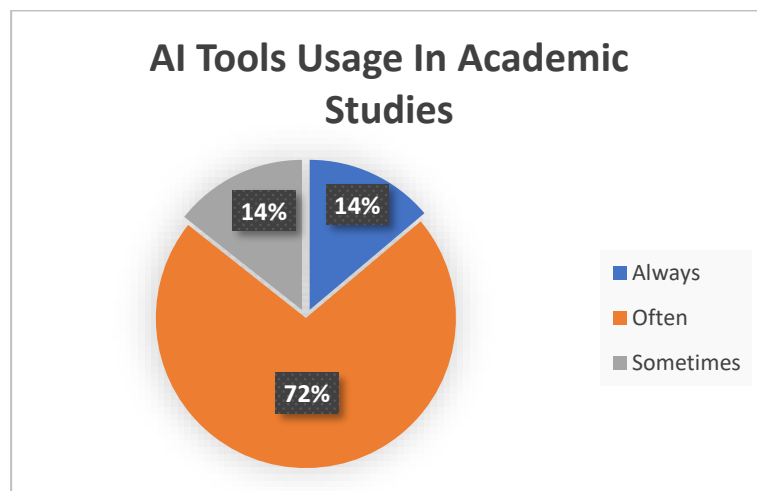
Source: Developed for the research

According to Table and Figure 4.1.2.4, 145 out of 200 respondents (72%) often utilized AI tools in their academic studies to assist them in their academic writing or problem solving. On the other hand, 28 respondents (14%) stated that they always utilize AI tools in their studies while another 29 respondents (14%) only sometimes utilized AI tools.

4.1.3 Central Tendencies Measurement of Conducts

The purpose of conducting the central tendency is to determine the mean score for five (5) interval scales of construct which involving the four independent variables (Personalized Learning, Feedback Mechanism, Usage Frequency, and Hedonic Motivation) and the dependent variable (Academic Writing Proficiency). The mean values for all the statements are generated through SPSS software, Besides, a 5-Point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" is used as the measurement.

4.1.3.1 Personalized Learning

Table 4.1.3.1 Central Tendencies Measurement of Constructs: Personalized Learning

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. Personalized AI writing tools can significantly improve my grammar and mechanics.	0.0	5.0	1.5	33.5	60.0	4.49	1
2. AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.	0.0	5.0	10.5	56.5	28.0	4.08	4
3. Using AI tools for personalized feedback on clarity, conciseness, and	0.0	0.0	14.0	46.5	39.5	4.26	3

organization makes my writing process more efficient and effective.						
4. Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.	0.0	0.5	15.5	38.0	46.0	4.30	2

Source: Developed for the research

According to Table 4.1.3.1, the independent variable consists of four (4) statement and the mean score range between 4.08 to 4.49. Based on the table above, the first statement shows a mean score of 4.49, which positioned at first. Next, the second statement shows a mean score of 4.08, which is positioned last. Furthermore, the third statement shows a mean score of 4.26, which is in third position. Lastly, the fourth statement shows a mean score of 4.30 and is positioned at second.

4.1.3.2 Feedback Mechanism

Table 4.1.3.2 Central Tendencies Measurement of Constructs: Feedback Mechanism

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.	0.5	13.0	1.5	41.0	44.0	4.15	4
2. AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing.	0.5	14.0	1.5	39.5	44.5	4.14	5
3. AI-generated content summarizing has improved my capacity to extract essential ideas from	0.0	5.0	1.0	44.0	50.0	4.39	2

difficult research articles, which has improved my writing comprehensions.						
4. Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.	0.0	5.0	1.0	54.0	40.0	4.29	3
5. AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.	0.0	5.0	0.5	43.0	51.5	4.41	1

Source: Developed for the research

According to Table 4.1.3.2, the independent variable consists of five (5) statement and the mean score range between 4.14 to 4.41. Based on the table above, the first statement shows a mean score of 4.15, which positioned at fourth. Next, the second statement shows a mean score of 4.14, which is positioned last. Furthermore, the third statement shows a mean score of 4.39, which is in second position. Moreover, the fourth statement shows a mean score of 4.29 and is positioned at third. Lastly, the fifth statement shows a mean score of 4.41 and is positioned at first.

4.1.3.3 Usage Frequency

Table 4.1.3.3 Central Tendencies Measurement of Constructs: Usage Frequency

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. I utilize AI-generated essay outlines to successfully arrange my ideas before writing.	0.0	0.0	16.0	43.5	40.5	4.25	3
2. I examine and enhance all my work using AI powered grammar and spelling checkers.	0.0	5.0	1.0	56.5	37.5	4.27	2
3. I use AI-based plagiarism detection technologies to assure the originality of my academic writing.	0.0	0.0	7.5	53.0	39.5	4.32	1
4. I utilize language translation AI to access academic literature written in languages other than my native language.	0.0	13.5	2.0	42.0	42.5	4.14	4
5. I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.	0.0	8.5	7.5	46.5	37.5	4.13	5

Source: Developed for the research

According to Table 4.1.3.3, the independent variable consists of five (5) statement and the mean score range between 4.13 to 4.32. Based on the table above, the first statement shows a mean score of 4.25, which positioned at

third. Next, the second statement shows a mean score of 4.27, which is positioned at second. Furthermore, the third statement shows a mean score of 4.32, which is in first position. Moreover, the fourth statement shows a mean score of 4.14 and is positioned at fourth. Lastly, the fifth statement shows a mean score of 4.13 and is positioned at last.

4.1.3.4 Hedonic Motivation

Table 4.1.3.4 Central Tendencies Measurement of Constructs: Hedonic Motivation

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. AI tools enhanced my enjoyment significantly in academic.	0.0	0.0	15.0	50.0	35.0	4.20	3
2. AI tools can augment my learning by providing tailored and adaptable learning experience.	0.0	0.0	14.0	44.5	41.5	4.28	2
3. I am inclined to utilize AI tools more frequently due to sense of motivation.	0.0	8.5	6.0	48.0	37.5	4.15	5
4. AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.	0.0	8.5	5.5	45.0	41.0	4.19	4

5. AI tools can help and lead me with a variety of administrative task to make my learning better.	0.0	0.0	6.0	54.0	40.0	4.34	1

Source: Developed for the research

According to Table 4.1.3.4, the independent variable consists of five (5) statement and the mean score range between 4.15 to 4.34. Based on the table above, the first statement shows a mean score of 4.20, which positioned at third. Next, the second statement shows a mean score of 4.28, which is positioned at second. Furthermore, the third statement shows a mean score of 4.15, which is in last position. Moreover, the fourth statement shows a mean score of 4.19 and is positioned at fourth. Lastly, the fifth statement shows a mean score of 4.34 and is positioned at first.

4.1.3.5 Academic Writing Proficiency

Table 4.1.3.5 Central Tendencies Measurement of Constructs: Academic Writing Proficiency

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	Ranking
1. I feel more confident in my ability to write clear and concise academic prose.	0.0	0.0	5.5	35.0	59.5	4.54	1
2. Using AI writing tools has improved the clarity	0.0	0.0	5.5	37.5	57.0	4.52	2

and organization of my academic writing.							
3. I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.	0.0	8.5	5.5	40.5	54.0	4.49	3
4. I perceive my understanding of grammatical rules and proper sentence structure to have improved	0.0	0.5	6.0	41.5	52.0	4.45	4

Source: Developed for the research

According to Table 4.1.3.5, the dependent variable consists of four (4) statement and the mean score range between 4.45 to 4.54. Based on the table above, the first statement shows a mean score of 4.54, which positioned at first. Next, the second statement shows a mean score of 4.52, which is positioned at second. Furthermore, the third statement shows a mean score of 4.49, which is in third position. Lastly, the fourth statement shows a mean score of 4.45 and is positioned at last.

4.2 Scale Measurement

4.2.1 Reliability Analysis Test

Table 4.2.1 Summary of Reliability Analysis Test Results

Variables	Number of Items	Mean	Standard Deviation	Cronbach's Alpha Value	N
Personalized Learning	4	17.11	2.257	0.761	200
Feedback Mechanism	5	21.38	3.345	0.837	200
Usage Frequency	5	21.10	3.096	0.840	200
Hedonic Motivation	5	21.15	3.028	0.865	200
Academic Writing Proficiency	4	17.99	1.859	0.761	200

Source: Developed for the research

In this research, Cronbach's Alpha has been adopted to measure the validity and reliability of the variables. There are total of 23 items being measured from the 5 different variables. All 23 items have undergone the reliability analysis to the determine the Cronbach's Alpha value by using SPSS software.

Based on the table 4.2.1, the results of the reliability analysis test for all five (5) variables have exceeded the Cronbach's Alpha value of 0.6, which is the minimum requirement to achieve reliability. As all variables have exceeded 0.6, it proves that the measurement scale is reliable and consistent. Moreover, Hedonic Motivation has the highest reliability among all the variables with the highest Cronbach's Alpha value of 0.865.

4.3 Inferential Analysis

4.3.1 Multiple Linear Regression Analysis

Multiple linear regression analysis is developed and used to explain the relationship between two or more independent variable and one continuous dependent variable. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity, independence of errors and homoscedasticity. The table below shows the result of the multiple linear regression analysis:

Table 4.3.1 Model Summary of Multiple Linear Regression

R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
0.703ᵃ	0.494	0.483	0.33418	1.841

Source: Developed for the research

   a. Predictors: (Constant), PL, FM, UF, HM
   b. Dependent Variable: AWP

Based on Table 4.3.1, the correlation coefficient (R) is approximately 0.703ᵃ, indicating a moderately significant positive correlation between the independent and dependent variables. The coefficient of determination (R^2) is around 0.494, indicating that approximately 49.4% of the variation in the dependent variable can be accounted for by the independent variables in the model. The Adjusted R-squared, which takes into consideration the number of predictors in the model, is around 0.483. This score indicates that, even after accounting for the number of predictors, approximately 48.3% of the variability in the dependent variable can be attributed to the model. The

Durbin-Watson statistic is around 1.841. The purpose of this statistic is to identify the existence of autocorrelation in the residuals (errors) of the regression model. A number in proximity to 2 indicates the absence of considerable autocorrelation.

Table 4.3.1.1 Summary of ANOVA Table

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	21.222	4	5.305	47.508	0.000[b]
Residual	21.777	195	0.112		
Total	42.999	199			

Source: Developed for the research

a. Predictors: (Constant), PL, FM, UF, HM
b. Dependent Variable: AWP

According to the ANOVA Table 4.3.1.1, the P-value has a significant level lower than 0.05. This proves that the ANOVA model indicates that the four independent variable (Personalized Learning, Feedback Mechanism, Usage Frequency and Hedonic Motivation) are significant in explain the dependent variable, which is the academic writing proficiency.

Table 4.3.1.2 Table of Coefficients

Source: Developed for the research

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	3.015	0.184		16.357	0.000		
Personalized Learning	0.372	0.106	0.452	3.516	0.001	0.157	6.362
Feedback Mechanism	0.432	0.091	0.622	4.726	0.000	0.150	6.669
Usage Frequency	0.197	0.110	0.263	1.794	0.074	0.121	8.268
Hedonic Motivation	-.660	0.100	-0.860	-6.622	0.000	0.154	6.490

a. Dependent Variable: AWP

Based on Table 4.3.1.2, the following linear equation is formed as:

Academic Writing Proficiency = 3.015 + 0.372 (Personalized Learning) + 0.432 (Feedback Mechanism) + 0.197 (Usage Frequency) + (-0.660) (Hedonic Motivation)

According to Table 4.3.1.2, the independent variables, Personalized Learning and Feedback Mechanism shows a significant relationship with undergraduates' academic writing proficiency. This is because the p-value of these two variables is lower than 0.05 (PL = 0.001, FM = 0.000). These two variables also show a positive coefficient where an increase in both variables can lead to increase in the dependent variable too. On the other hand, it can be shown that Usage Frequency does not have a significant relationship with undergraduates' academic writing proficiency as the p-

value is higher than 0.5, which is 0.74. Based on Table 4.3.1.2, it can be shown that Hedonic Motivation has a negative coefficient (-0.660) but has a p-value lower than 0.05 (p-value = 0.000). Although the coefficient is negative, the p-value, which is statistically significant, indicates strong evidence to reject the null hypothesis, which may state that there is no relationship between hedonic drive and undergraduate academic writing proficiency.

Based on the linear equation formed above, the regression coefficient of Personalized Learning, Feedback Mechanism, and Usage Frequency has positive coefficient. This shows that if one of these three independent variable shows an increase in one unit while other remain constant, the level of undergraduates' academic writing proficiency will increase by the respective Beta value. On the other hand, Hedonic Motivation shows a negative correlation, which means an additional of one unit while other independent variable remain constant will lead to a decrease in the level of undergraduates' academic writing proficiency.

Lastly, the standardized coefficient beta's function is to explain the influential level between the variables after computing into an equation. Based on the table above, Feedback Mechanism has the most significant influence on undergraduates' academic writing proficiency as it has a value of 0.622 compared to other independent variables.

4.3.2 Hypothesis Testing

The purpose of this research is to investigate the factors that may affect the impact of AI tools on undergraduates' academic writing proficiency. There are four (4) hypotheses developed to be examined for the research. The aim

of the analysis is to identify the determination of the hypothesis. Based on the results shown in Table 4.3.2, there are 3 out of 4 hypotheses (PL, FM, HM) that are being supported while one hypothesis (UF) is not supported due to insignificant positive result.

Table 4.3.2 Summary of Hypothesized Relationship

Hypothesis	Outcome (Multiple Linear Regression Analysis Results)	Determination
H1: Personalized learning of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.	Significant value: 0.001 P-value < 0.05	Supported
H2: Feedback mechanism of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.	Significant value: 0.000 P-value < 0.05	Supported
H3: Usage frequency of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.	Significant value: 0.074 P-value > 0.05	Not Supported
H4: Hedonic motivation of AI tools has a significant relationship with the impact on undergraduates' academic writing proficiency.	Significant value: 0.000 P-value < 0.05	Supported

Source: Developed for the research

4.4 Conclusion

In conclusion, the research utilized SPSS software to gather and generate the necessary data analysis needed for the chapter and research. Moreover, a total of 200 respondents participated in the questionnaire and the data had been interpreted by using descriptive and inferential analysis. Hence, the elaboration of the results and findings will be further discussed in Chapter 5.

CHAPTER 5: DISCUSSION AND IMPLICATION

5.0 Introduction

The contribution of this chapter are the interpretations of the findings that has been collected from the survey research analysis. Moreover, the discussion of the research regarding the limitation during the progression and the recommendations for future study are also suggested in this chapter.

5.1 Discussions on Major Findings

The main purpose of the research is to determine the factors that affect how AI tools impact undergraduates' academic writing proficiency. A total of four (4) hypothesis were developed for the study. According to Table 4.3.2, which highlighted the results of the hypotheses testing, shows that only three hypotheses were valid while H3 was rejected.

5.1.1 Findings on Hypothesis

5.1.1.1 Personalized Learning and Academic Writing Proficiency

The findings on H_1 indicated that Personalized Learning has a positive significant relationship with undergraduates' academic writing proficiency, with a beta value of 0.372 and the p-value of 0.001, which is lower than 0.05. According to a similar study done by Das et al. (2023), it can be proven that AI tools' ability in adapting the learning algorithms and personalizing the

learning experience of undergraduates has a positive impact on their academic writing proficiency and their academic achievement. It shows that AI tools can develop student's critical thinking and provide support in concept understanding. Moreover, the research study done by Tapalova & Zhiyenbayeva (2022) also shows that personalized learning made possible by AI tools allows the improvement in quality of learning material and resources, which results in efficient and effective students' engagement in learning and improvement in their academic writing proficiency. Hence, the findings of H_1 that shows that personalized learning has a positive relationship with undergraduates' academic writing proficiency is supported.

5.1.1.2 Feedback Mechanism and Academic Writing Proficiency

The findings on H_2 shows that there is a positive significant relationship between Feedback Mechanism of AI tools and undergraduates' academic writing proficiency, with a beta value of 0.432 and the p-value of 0.000, which is lower than 0.05. According to the research done by Nazari et al. (2021), the traditional education system does not provide required formative feedback for students, but now students are able to receive prompt and immediate feedback with the help of AI tools. For example: self-evaluation and revision review system can allow students to be more engaged, knowledge builders, active and autonomous in their academic writing. Moreover, the research also shows that AI tools with AWE's feedback mechanism can improve the students' confidence in academic writing, specifically when they receive positive feedback. Providing intelligent feedback enables students to enhance their writing independence by helping them to analyze their mistakes, recognize recurring writing patterns, and revise their faults, especially in the absence of human assistance. Moreover, research done by Shi & Deng (2023) also proves that AI tools' feedback mechanisms can offer a higher degree of objectivity and consistency in feedback results as opposed to humans. This may contribute to an overall

improvement in quality and quantity of students' academic writings. Hence, the findings of H_2 that shows that feedback mechanism has a positive relationship with undergraduates' academic writing proficiency is supported.

5.1.1.3 Usage Frequency and Academic Writing Proficiency

The findings of H_3 shows that Usage Frequency of AI tools does not have a positive significant relationship with undergraduates' academic writing proficiency, with a beta value of 0.197 and p-value of 0.074 which is more than 0.05. Research done by Bailey et al. (2021) stated that students with a higher participation in using AI tools in academic resulted in higher confidence and increased in their language and writing proficiency, while on the other hand the study conducted by Yildiz Durak (2023 stated that there is no relationship between usage frequency and academic writing proficiency as the mere frequency of use is not a significant determinant, rather user pleasure can influence users' self-effacement. Hence, this research was aimed to determine whether usage frequency is a main factor that has an influence on undergraduates' academic writing proficiency. However, the findings of H_3 shows that usage frequency does not have a positive relationship with undergraduates' academic writing proficiency and shows that it is not the main factor that has influence on the academic writing proficiency. According to Al Shuraiaan et al. (2024), frequent usage of AI tools may not be beneficial if students do not learn to balance their use of technology with other learning strategies.

5.1.1.4 Hedonic Motivation and Academic Writing Proficiency

The findings on H$_4$ indicated that Hedonic Motivation has a negative but significant relationship with undergraduates' academic writing proficiency, with a beta value of - 0.660 and the p-value of 0.000, which is lower than 0.05. Based on the research conducted by J. K. M. Ali et al. (2023), it can be proven that students are more likely to include AI tools into their academic routines when their interactions with AI tools provide both stimulating and rewarding intrinsic motivation, which results in improvement in academic writing proficiency. Moreover, research conducted by Abbas et al. (2022) shows that a direct relationship between AI tools and their enhancement of student involvement in higher education institutions which motivates students and results in academic improvements. Hence, H$_4$ stating that hedonic motivation has a significant relationship with academic writing proficiency is supported.

On the other hand, the findings on H$_4$ shows a negative relationship. According to Al Shuraiaan et al. (2024), there are a few reasons why there is a negative relationship. Firstly, is potential superficial learning. If students are driven by hedonic factors, such as deriving pleasure, rather than a genuine desire to enhance their writing abilities, they may interact with AI tools in a superficial manner. Their focus would be more on the enjoyment of utilizing the technology rather than on deepening their comprehension of academic writing principles. Next reason is distractions and dependence. Similarly, if students are primarily motivated by hedonic factors, they may become overly reliant on AI tools for writing tasks, leading to a dependence that hinders the development of their independent writing skills. This overreliance on technology can distract students from engaging critically with the writing process and may limit their growth in academic writing proficiency (Al Shuraiaan et al., 2024).

5.1.2 Conclusion on Findings on Hypothesis

In a nutshell, the variables – Personalized Learning and Feedback Mechanism of AI tools are indicated as positive significant relationships with undergraduates' academic writing proficiency while Hedonic Motivation indicates a negative significant relationship. Whereas Usage Frequency indicates not significant relationship with the dependent variable. Furthermore, H_1, H_2 and H_4 have effects on undergraduates' academic writing proficiency, while H_3 does not affect undergraduates' academic writing proficiency. Moreover, to fulfil the research questions constructed in Chapter 1 whereby "Which of the determinants affect the most in respect of undergraduates' academic writing proficiency?", out of the four independent variables, Feedback Mechanism would be the best answer as its significant value of 0.000 is lower than 0.05 as shown in the multiple linear regression analysis result and it has a positive coefficient with the dependent variable. Although Hedonic Motivation also has a significant value of 0.000 but it has a negative coefficient so it might not have the most effect on undergraduates' academic writing proficiency. Whereas other independent variables like Personalized Learning and Usage Frequency have significant value of 0.001 and 0.074. Thus, we can conclude that H_1, H_2 and H_4 were found to be valid in our study.

5.2 Implications of Study

This study provides insights for academic institutions and educational technology developers. The gathered information through the questionnaire surveys and the indication of results provides a better understanding of all the variables, which are personalized learning, feedback mechanism, usage frequency and hedonic motivation of AI tools. It is definite useful to these institutions and developers who are determined in contributing to the elevation of student's academic writing and overall proficiency. Besides, the research findings may allow these institutions and

developers to improve the functions and capabilities of AI tools and tailored them to the needs for students in their academic. Moreover, the finding's results indicate that personalized learning, feedback mechanism and hedonic motivation of AI tools have significant relationship with academic writing proficiency.

Through the results of personalized learning, it shows that it has a significant impact on undergraduates' academic writing proficiency. Referring to past studies, it was shown that students are more engaged in using AI tools for academic purposes due to the personalized learning features that allows them to tailor the learning experience to match their specific requirements and strengths (Vincent-Lancrin & Van Der Vlies, 2020). With the accepted and supported hypothesis, this research's insights may encompass the identification of distinct attributes of AI systems that enhance personalized learning experiences, such as adaptive feedback, customized learning paths, or personalized writing prompts. Gaining insight into the efficacy of personalized learning in enhancing writing proficiency can provide educators and developers with valuable guidance in developing more impactful ways for academic writing teaching.

Moreover, the results also indicated that feedback mechanism of AI tools has a significant influence on undergraduates' academic writing proficiency. Referring to past studies, it was shown that timely and prompt feedback provided by AI tools are able to promote active participation from students and enhance their academic performance, motivation, and ability to regulate their own learning needs and goals. With the hypothesis proven, this insight might provide academic institutions a better understanding on how AI tools' feedback mechanism are able to influence the writing or learning outcome of users, and inform developers about the ideas of design and implementation of AI-supported writing instructions.

Furthermore, the results show that undergraduates and students are more likely to engage in utilizing AI tools in their academic due to the hedonic motivation of AI tools. As they are more likely to seek for stimulating and pleasurable AI tools that

demonstrate expertise, engagement, and well-organized content. The interactive and dialogic aspect of AI Tools holds the capacity to augment pleasure and entertainment with its distinguishing feature (Foroughi et al., 2023). By comprehending the significance of hedonic motivation, developers may enhance the design of AI tools to make them more captivating and pleasurable to use. This, in turn, can improve students' writing experiences and outcomes. For instance, we can incorporate gamified components into AI tools to make writing tasks more interactive and enjoyable. Moreover, the research may motivate academic teachers to implement AI tools in classes to enhance the enjoyment of learning and allow students to be more engaged in education with the help of hedonic motivation.

5.3 Limitations and Recommendations of Study

Several potential limitations should be considered for this researched which can be managed by future researchers.

A limitation of this research is the absence of qualitative research in data collection. While quantitative research aims to analyze the correlation between independent and dependent variables, it does not provide insights into the reasons behind respondents'   choices.

Quantitative research exclusively provides statistical results that can be achieved alone through the use of SSPS software. Furthermore, the participants have a restricted range of options to select from, which can potentially result in an imprecise outcome during qualitative research. The responders are limited to selecting the answers provided in the questionnaire, where the respondents might have other responses to the questions. Therefore, to achieve more precise findings for the study, it is recommended that the researchers employ qualitative research methods in addition to quantitative research. This is because qualitative research can offer more comprehensive information, including trustworthy

data when conducting interactions with respondents. Hence, it is recommended that researchers employ a combination of qualitative and quantitative research methods in future studies. This approach allows for gathering more comprehensive information from qualitative respondents and mitigates the risk of confusion among respondents when completing questionnaires.

Another limitation is the limitation of study in areas of how AI tools might affect academic writing proficiency in Malaysia. The limited availability of data on factors that might have an impact on academic writing proficiency presents difficulties in comprehensively comprehending the complexity of academic writing proficiency among undergraduate students. Without a comprehensive dataset that includes a wide range of variables, it is challenging to determine the degree to which AI tools enhance writing skills. It is also difficult to identify any factors that may moderate or mediate the relationship between the use of AI tools and writing outcomes. Hence it is recommended that future researchers can conduct longitudinal studies to monitor the progress of students' writing skills over a period and gather information on the elements that impact their writing growth. Longitudinal research enables the investigation of causal links and the identification of factors that influence changes in writing skill throughout the course of students' academic journeys. Moreover, they can employ mixed methods. For example: utilize mixed-methods research methodologies to collect both quantitative and qualitative data on the elements that impact academic writing proficiency. Researchers can achieve a full grasp of the complicated relationship between many factors and writing outcomes by integrating survey data with interviews, focus groups, or observational studies.

5.4 Conclusion

In a nutshell, the research has been successfully achieved the research objective which is to investigate the factors of utilizing AI tools that influence undergraduates' academic writing proficiency, and to investigate the relationships between the

determinants and the dependent variable. As going through the analysis, we found that not every single independent variable is having a significant impact with the dependent variable. There are only three (3) independent variables have a significant impact towards the dependent variable, while one (1) independent variable shows a not significant impact to the undergraduates' academic writing proficiency after we completed the analysis. Hence, there are several recommendations have been suggested for future researchers as a guidance when they want to conduct a similar research and other institutions are also suggested to have a look in-depth of the research to have a better understanding on the factors that might affect the academic writing proficiency of undergraduates.

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Appendices

Appendix A: Survey Questionnaire

The Effects of AI Tools on Undergraduates' Academic Writing Proficiency

Dear participant,

I am an undergraduate student of Bachelor of International Business (Honours) at Universiti Tunku Abdul Rahman (UTAR), and I am currently conducting my research project on **"The Effects of AI Tools on Undergraduates' Academic Writing Proficiency"**. Your valuable insights will make a significant contribution to this research.

Your cooperation and support are needed to complete the questionnaire, the survey will take approximately 5-15 minutes. Neither your personal information nor personal identity will be revealed. Your participation will be anonymous and all the information will be kept confidential and for academic purposes only.

Should you have any enquire, please do not hesitate to contact me via the information given below.

Thank you once again for your precious time in participating this study.

Yours faithfully,
Ng Shi Zhe
2002420
012-3661938
Ng.shizhe@1utar.my

Appendix 3.0.1 Introduction and contact details of questionnaire

Section A: Demographic Information

Please provide the following demographic information to help me analyze responses effectively. Your responses are critical to the accuracy and relevance of my research. All information collected is strictly confidential.

1. Gender *

○ Male
○ Female

2. Age *

○ 16 - 19
○ 20 - 25
○ 26 & above
○ Prefer not to say

3. Education Level *

○ High School or Equivalent
○ Foundation
○ Diploma
○ Undergraduate (eg. Degree)
○ Postgraduate (eg. Masters/PHD)
○ Other: _____

4. Race/Ethnicity *

○ Malay
○ Chinese
○ Indian
○ Other: _____

Appendix 3.0.2 Questionnaire of demographic information

2. Which academic AI tools do you often use? *

☐ Grammarly

☐ ChaptGPT

☐ Quillbot

☐ WordTune

☐ Other:

Section B: General Information

1. What is your level of exposure to Artificial Intelligence (AI) tools? *

○ Very high

○ High

○ Moderate

○ Low

○ Very low

3. What is the purpose of you using AI tools?

☐ Entertainment

☐ Academic

☐ Experimental research

☐ Other:

4. How often do you use AI tools in academic studies? *

○ Always

○ Often

○ Sometimes

○ Rarely

○ Never (Thank you for your participation)

Appendix 3.0.3 Questionnaire of general information

Section C

This section explores the influence of AI tools on undergraduates' academic writing proficiency through four distinct effects: **Personalized learning, Feedback mechanism, Usage Frequency and Hedonic Motivation.**

Please rate the following statement on a scale of 1 to 5.
(1) Strongly Disagree, (2) Disagree, (3) Neutral, (4) Agree, (5) Strongly Agree

1. Personalized Learning *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Personalized AI writing tools can significantly improve my grammar and mechanics.	○	○	○	○	○
AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.	○	○	○	○	○

Using AI tools for personalized feedback on clarity, conciseness, and organization makes my writing process more efficient and effective.
○ ○ ○ ○ ○

Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.
○ ○ ○ ○ ○

Appendix 3.0.4 Questionnaire of IV: Personalized Learning

2. Feedback Mechanism *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.	◯	◯	◯	◯	◯
AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing	◯	◯	◯	◯	◯

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AI-generated content summarizing has improved my capacity to extract essential ideas from difficult research articles, which has improved my writing comprehensions.	◯	◯	◯	◯	◯
Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.	◯	◯	◯	◯	◯
AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.	◯	◯	◯	◯	◯

Appendix 3.0.5 Questionnaire of IV: Feedback Mechanism

3. Usage Frequency *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I utilize AI-generated essay outlines to successfully arrange my ideas before writing	◯	◯	◯	◯	◯
I examine and enhance all my work using AI powered grammar and spelling checkers	◯	◯	◯	◯	◯
I use AI-based plagiarism detection technologies to assure the originality of my academic writing.	◯	◯	◯	◯	◯

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I utilize language translation AI to access academic literature written in languages other than my native language.	◯	◯	◯	◯	◯
I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.	◯	◯	◯	◯	◯

Appendix 3.0.6 Questionnaire of IV: Usage Frequency

4. Hedonic Motivation *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AI tools enhanced my enjoyment significantly in academic.	◯	◯	◯	◯	◯
AI tools can augment my learning by providing tailored and adaptable learning experience	◯	◯	◯	◯	◯
I am inclined to utilize AI tools more frequently due to sense of motivation.	◯	◯	◯	◯	◯

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.	◯	◯	◯	◯	◯
AI tools can help and lead me with a variety of administrative task to make my learning better.	◯	◯	◯	◯	◯

Appendix 3.0.7 Questionnaire of IV: Hedonic Motivation

Perceived Proficiency *

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I feel more confident in my ability to write clear and concise academic prose.	○	○	○	○	○
Using AI writing tools has improved the clarity and organization of my academic writing	○	○	○	○	○
I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.	○	○	○	○	○
I perceive my understanding of grammatical rules and proper sentence structure to have improved	○	○	○	○	○

Appendix 3.0.8 Questionnaire of DV: Perceived Proficiency

Appendix B: Pilot Test

Appendix 3.4.1 Pilot test result of DV: Perceived Proficiency

```
RELIABILITY
  /VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmyabilitytowr
    PerceivedProficiencyUsingAIwritingtoolshasimprovedthec
    PerceivedProficiencyIfindAIwritingtoolstobemoreeffici
    PerceivedProficiencyIperceivemyunderstandingofgrammatica
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		01-APR-2024 23:32:03
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ PILOT TEST.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	30
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmy abilitytowr PerceivedProficiencyUsingAIwritingtoolshasimprovedthec PerceivedProficiencyIfindAIwritingtoolstobemoreeffici PerceivedProficiencyIperceivemyunderstandingofgrammati ca /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excludedᵃ	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the
procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.849	4

Item Statistics

	Mean	Std. Deviation	N
PerceivedProficiencyIfeelmoreconfidentinmyabilitytowr	3.93	.740	30
PerceivedProficiencyUsingAIwritingtoolshasimprovedthec	4.07	.691	30
PerceivedProficiencyIfindAIwritingtoolstobemoreeffici	4.00	.643	30
PerceivedProficiencyIperceivemyunderstandingofgrammatica	4.00	.643	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
PerceivedProficiencyIfeelmoreconfidentinmyabilitytowr	12.07	3.237	.496	.895
PerceivedProficiencyUsingAIwritingtoolshasimprovedthec	11.93	3.030	.663	.819
PerceivedProficiencyIfindAIwritingtoolstobemoreeffici	12.00	2.897	.819	.755
PerceivedProficiencyIperceivemyunderstandingofgrammatica	12.00	2.897	.819	.755

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.00	5.103	2.259	4

Appendix 3.4.2 Pilot test result of IV: Perceived Ease of Use

```
RELIABILITY

/VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingtoolscansig
    @1.PersonalizedLearningAItoolscaneffectivelysuggestvoca
    @1.PersonalizedLearningUsingAItoolsforpersonalizedfeedb
    @1.PersonalizedLearningIamconcernedthatrelyingonAItoo
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

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	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY /VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingtoolscansig @1.PersonalizedLearningAItoolscaneffectivelysuggestvoca @1.PersonalizedLearningUsingAItoolsforpersonalizedfeedb @1.PersonalizedLearningIamconcernedthatrelyingonAItoo /SCALE('ALL VARIABLES') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.661	4

Item Statistics

	Mean	Std. Deviation	N
@1.PersonalizedLearningPersonalizedAIwritingtoolscansig	4.10	.481	30
@1.PersonalizedLearningAItoolscaneffectivelysuggestvoca	4.13	.434	30
@1.PersonalizedLearningUsingAItoolsforpersonalizedfeedb	4.00	.643	30
@1.PersonalizedLearningIamconcernedthatrelyingonAItoo	4.20	.484	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
@1.PersonalizedLearningPersonalizedAIwritingtoolscansig	12.33	1.195	.656	.450
@1.PersonalizedLearningAItoolscaneffectivelysuggestvoca	12.30	1.459	.447	.596
@1.PersonalizedLearningUsingAItoolsforpersonalizedfeedb	12.43	1.082	.464	.593
@1.PersonalizedLearningIamconcernedthatrelyingonAItoo	12.23	1.564	.262	.701

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
16.43	2.116	1.455	4

Appendix 3.4.3 Pilot test result of IV: Feedback Mechanism

```
RELIABILITY

/VARIABLES=@2.FeedbackMechanismAIpoweredgrammarandspellingchecksha
    @2.FeedbackMechanismAIbasedplagiarismdetectionsystemshav
    @2.FeedbackMechanismAIgeneratedcontentsummarizinghasimpr
    @2.FeedbackMechanismUsingAIwritingaidshasincreasedthec
    @2.FeedbackMechanismAIgeneratedessayoutlineshavehelpedm
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		01-APR-2024 23:30:06
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ PILOT TEST.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	30
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		/VARIABLES=@2.FeedbackMechanismAIpoweredgrammaran dspellingchecksha
		@2.FeedbackMechanismAIbasedplagiarismdetectionsystemsh av
		@2.FeedbackMechanismAIgeneratedcontentsummarizinghasi mpr
		@2.FeedbackMechanismUsingAIwritingaidshasincreasedthec
		@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpe dm
		/SCALE('ALL VARIABLES') ALL
		/MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE
		/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excludedᵃ	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.782	5

Item Statistics

	Mean	Std. Deviation	N
@2.FeedbackMechanismAIpoweredgrammarandspellingchecksha	4.07	.785	30
@2.FeedbackMechanismAIbasedplagiarismdetectionsystemshav	4.07	.583	30
@2.FeedbackMechanismAIgeneratedcontentsummarizinghasimpr	4.27	.640	30
@2.FeedbackMechanismUsingAIwritingaidshasincreasedthec	4.03	.615	30
@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpedm	4.23	.679	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
@2.FeedbackMechanismAIpoweredgrammarandspellingchecksha	16.60	3.421	.637	.714
@2.FeedbackMechanismAIbasedplagiarismdetectionsystemshav	16.60	5.421	.046	.875
@2.FeedbackMechanismAIgeneratedcontentsummarizinghasimpr	16.40	3.559	.794	.661
@2.FeedbackMechanismUsingAIwritingaidshasincreasedthec	16.63	4.102	.564	.740
@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpedm	16.43	3.357	.831	.641

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
20.67	5.885	2.426	5

Appendix 3.4.4 Pilot test result of IV: Usage Frequency

```
RELIABILITY

/VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayoutlinestosuc
    @3.UsageFrequencyIexamineandenhanceallmyworkusingAIp
    @3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnolo
    @3.UsageFrequencyIutilizelanguagetranslationAItoaccess
    @3.UsageFrequencyIutilizeAItoolstoassistmeintailoring
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		01-APR-2024 23:31:09
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ PILOT TEST.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	30
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.
Syntax		RELIABILITY
		/VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayou tlinestosuc
		@3.UsageFrequencyIexamineandenhanceallmyworkusingAIp
		@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnolo
		@3.UsageFrequencyIutilizelanguagetranslationAItoaccess
		@3.UsageFrequencyIutilizeAItoolstoassistmeintailoring
		/SCALE('ALL VARIABLES') ALL
		/MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE
		/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00

	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.888	5

Item Statistics

	Mean	Std. Deviation	N
@3.UsageFrequencyIutilizeAIgeneratedessayoutlinestosuc	3.93	.944	30
@3.UsageFrequencyIexamineandenhanceallmyworkusingAIp	3.83	.874	30
@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnolo	4.23	.568	30
@3.UsageFrequencyIutilizelanguagetranslationAItoaccess	3.87	.900	30
@3.UsageFrequencyIutilizeAItoolstoassistmeintailoring	3.93	.868	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
@3.UsageFrequencyIutilizeAIgeneratedessayoutlinestosuc	15.87	7.430	.760	.858
@3.UsageFrequencyIexamineandenhanceallmyworkusingAIp	15.97	7.689	.780	.852
@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnolo	15.57	10.254	.455	.915
@3.UsageFrequencyIutilizelanguagetranslationAItoaccess	15.93	7.651	.759	.857
@3.UsageFrequencyIutilizeAItoolstoassistmeintailoring	15.87	7.223	.912	.819

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
19.80	12.234	3.498	5

Appendix 3.4.5 Pilot test result of IV: Hedonic Motivation

```
RELIABILITY

/VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignifica
n
    @4.HedonicMotivationAItoolscanaugmentmylearningbyprovi
    @4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefr
    @4.HedonicMotivationAItechnologyprovideessentialtoolsand
    @4.HedonicMotivationAItoolscanhelpandleadmewithavari
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		01-APR-2024 23:31:35
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ PILOT TEST.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	30
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		
		/VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignifican
		    @4.HedonicMotivationAItoolscanaugmentmylearningbyprovi
		    @4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefr
		    @4.HedonicMotivationAItechnologyprovideessentialtoolsand
		    @4.HedonicMotivationAItoolscanhelpandleadmewithavari
		  /SCALE('ALL VARIABLES') ALL
		  /MODEL=ALPHA
		  /STATISTICS=DESCRIPTIVE SCALE
		  /SUMMARY=TOTAL.

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	30	100.0
	Excluded[a]	0	.0
	Total	30	100.0

a. Listwise deletion based on all variables in the

procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.888	5

Item Statistics

	Mean	Std. Deviation	N
@4.HedonicMotivationAItools enhancedmyenjoymentsignifi can	4.00	.743	30
@4.HedonicMotivationAItools canaugmentmylearningbypro vi	3.93	.740	30
@4.HedonicMotivationIaminc linedtoutilizeAItoolsmorefr	4.07	.691	30
@4.HedonicMotivationAItech nologyprovideessentialtoolsa nd	4.00	.643	30
@4.HedonicMotivationAItools canhelpandleadmewithavari	4.20	.714	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
@4.HedonicMotivationAItoolsenhancedmyenjoymentsignifican	16.20	5.200	.855	.833
@4.HedonicMotivationAItoolscanaugmentmylearningbyprovi	16.27	5.857	.627	.889
@4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefr	16.13	5.775	.721	.866
@4.HedonicMotivationAItechnologyprovideessentialtoolsand	16.20	6.028	.699	.872
@4.HedonicMotivationAItoolscanhelpandleadmewithavari	16.00	5.586	.756	.858

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
20.20	8.648	2.941	5

Appendix C: Frequencies

Appendix 4.1.1 Frequencies of Demographic Profile Result

```
GET
  FILE='C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ
Descriptive Test.sav'.
DATASET NAME DataSet1 WINDOW=FRONT.
FREQUENCIES VARIABLES=@1.Gender @2.Age @3.EducationLevel
@4.RaceEthnicity
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		20-APR-2024 21:19:59
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Descriptive Test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.Gender @2.Age @3.EducationLevel @4.RaceEthnicity /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

```
[DataSet1] C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ
Descriptive Test.sav
```

Statistics

		1. Gender	2. Age	3. Education Level	4. Race/Ethnicity
N	Valid	200	200	200	200
	Missing	0	0	0	0

Frequency Table

1. Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	101	50.5	50.5	50.5
	Male	99	49.5	49.5	100.0
	Total	200	100.0	100.0	

2. Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16 - 19	2	1.0	1.0	1.0
	20 - 25	195	97.5	97.5	98.5
	26 & above	3	1.5	1.5	100.0
	Total	200	100.0	100.0	

3. Education Level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Diploma	2	1.0	1.0	1.0
	Postgraduate (eg. Masters/PHD)	2	1.0	1.0	2.0
	Undergraduate (eg. Degree)	196	98.0	98.0	100.0
	Total	200	100.0	100.0	

4. Race/Ethnicity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Chinese	140	70.0	70.0	70.0
	Indian	23	11.5	11.5	81.5
	Malay	37	18.5	18.5	100.0
	Total	200	100.0	100.0	

```
FREQUENCIES
VARIABLES=@1.WhatisyourlevelofexposuretoArtificialIntelligenceAIto
ols
    @4.HowoftendoyouuseAItoolsinacademicstudies
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		20-APR-2024 21:37:03
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Descriptive Test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.WhatisyourlevelofexposuretoArtificialIntelligenceAItools @4.HowoftendoyouuseAItoolsinacademicstudies /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.02

Statistics

		1. What is your level of exposure to Artificial Intelligence (AI) tools?	4. How often do you use AI tools in academic studies?
N	Valid	200	200
	Missing	0	0

Frequency Table

1. What is your level of exposure to Artificial Intelligence (AI) tools?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	High	138	69.0	69.0	69.0
	Moderate	41	20.5	20.5	89.5
	Very high	20	10.0	10.0	99.5
	Very low	1	.5	.5	100.0
	Total	200	100.0	100.0	

4. How often do you use AI tools in academic studies?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Always	26	13.0	13.0	13.0
	Often	145	72.5	72.5	85.5
	Sometimes	29	14.5	14.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.3 Frequencies of General Information Result: Q2 and Q3

```
MULT RESPONSE GROUPS=$AITools (grammarly chatgpt quillbot wordtune
paraphraser.io (1)) $Purpose
    (entertainment academic experimentalresearch (1))
  /FREQUENCIES=$AITools $Purpose.
```

Multiple Response

Notes

Output Created		20-APR-2024 21:34:38
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Descriptive Test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics for each table are based on all the cases with valid data in the specified range(s) for all variables in each table.
Syntax		MULT RESPONSE GROUPS=$AITools (grammarly chatgpt quillbot wordtune paraphraser.io (1)) $Purpose (entertainment academic experimentalresearch (1)) /FREQUENCIES=$AITools $Purpose.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Case Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
$AITools[a]	200	100.0%	0	0.0%	200	100.0%
$Purpose[a]	200	100.0%	0	0.0%	200	100.0%

a. Dichotomy group tabulated at value 1.

$AITools Frequencies

		Responses		Percent of Cases
		N	Percent	
$AITools[a]	Grammarly	139	32.8%	69.5%
	ChatGPT	192	45.3%	96.0%
	Quillbot	52	12.3%	26.0%
	WordTune	3	0.7%	1.5%
	Paraphraser.io	38	9.0%	19.0%
Total		424	100.0%	212.0%

a. Dichotomy group tabulated at value 1.

$Purpose Frequencies

		Responses		Percent of Cases
		N	Percent	
$Purpose[a]	Entertainment	19	7.8%	9.5%
	Academic	195	79.6%	97.5%
	Experimental research	31	12.7%	15.5%
Total		245	100.0%	122.5%

a. Dichotomy group tabulated at value 1.

Appendix 4.1.4.1 Frequencies of Personalized Learning

```
FREQUENCIES
VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingtoolscansign
ificantl

@1.PersonalizedLearningAItoolscaneffectivelysuggestvocabularyand

@1.PersonalizedLearningUsingAItoolsforpersonalizedfeedbackonclar

@1.PersonalizedLearningRelyingonAItoolsforpersonalizedlearningco
  /STATISTICS=MEAN MEDIAN MODE SUM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 11:54:15
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingtoolscansignificantl @1.PersonalizedLearningAItoolscaneffectivelysuggestvocabularyand @1.PersonalizedLearningUsingAItoolsforpersonalizedfeedbackonclar @1.PersonalizedLearningRelyingonAItoolsforpersonalizedlearningco /STATISTICS=MEAN MEDIAN MODE SUM /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Statistics

		1. Personalized Learning [Personalized AI writing tools can significantly improve my grammar and mechanics.]	1. Personalized Learning [AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.]	1. Personalized Learning [Using AI tools for personalized feedback on clarity, conciseness, and organization makes my writing process more efficient and effective.]	1. Personalized Learning [Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.49	4.08	4.26	4.30
Median		5.00	4.00	4.00	4.00
Mode		5	4	4	5
Sum		897	815	851	859

Frequency Table

1. Personalized Learning [Personalized AI writing tools can significantly improve my grammar and mechanics.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	3	1.5	1.5	6.5
	4	67	33.5	33.5	40.0
	5	120	60.0	60.0	100.0
	Total	200	100.0	100.0	

1. Personalized Learning [AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	21	10.5	10.5	15.5
	4	113	56.5	56.5	72.0
	5	56	28.0	28.0	100.0
	Total	200	100.0	100.0	

1. Personalized Learning [Using AI tools for personalized feedback on clarity, conciseness, and organization makes my writing process more efficient and effective.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	28	14.0	14.0	14.0
	4	93	46.5	46.5	60.5
	5	79	39.5	39.5	100.0
	Total	200	100.0	100.0	

1. Personalized Learning [Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.5	.5	.5
	3	31	15.5	15.5	16.0
	4	76	38.0	38.0	54.0
	5	92	46.0	46.0	100.0
	Total	200	100.0	100.0	

Appendix 4.1.4.2 Frequencies of Feedback Mechanism

```
FREQUENCIES
VARIABLES=@2.FeedbackMechanismAIpoweredgrammarandspellingcheckshav
eassiste

@2.FeedbackMechanismAIbasedplagiarismdetectionsystemshaveraisedm

@2.FeedbackMechanismAIgeneratedcontentsummarizinghasimprovedmyca

@2.FeedbackMechanismUsingAIwritingaidshasincreasedtheclarityandc

@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpedmearrangem
  /STATISTICS=MEAN MEDIAN MODE SUM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 13:44:33
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.

Syntax		FREQUENCIES VARIABLES=@2.FeedbackMechanismAIpoweredgrammarand spellingcheckshaveassiste
		
		@2.FeedbackMechanismAIbasedplagiarismdetectionsystemsh averaisedm
		
		@2.FeedbackMechanismAIgeneratedcontentsummarizinghasi mprovedmyca
		
		@2.FeedbackMechanismUsingAIwritingaidshasincreasedthecl arityandc
		
		@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpe dmearrangem
		  /STATISTICS=MEAN MEDIAN MODE SUM
		  /ORDER=ANALYSIS.

Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Statistics

		2. Feedback Mechanism [AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.]	2. Feedback Mechanism [AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing]	2. Feedback Mechanism [AI-generated content summarizing has improved my capacity to extract essential ideas from difficult research articles, which has improved my writing comprehensio ns.]	2. Feedback Mechanism [Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.]	2. Feedback Mechanism [AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.]
N	Valid	200	200	200	200	200

Missing	0	0	0	0	0
Mean	4.15	4.14	4.39	4.29	4.41
Median	4.00	4.00	4.50	4.00	5.00
Mode	5	5	5	4	5
Sum	830	827	878	858	882

Frequency Table

2. Feedback Mechanism [AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	26	13.0	13.0	13.5
	3	3	1.5	1.5	15.0
	4	82	41.0	41.0	56.0
	5	88	44.0	44.0	100.0
	Total	200	100.0	100.0	

2. Feedback Mechanism [AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	.5	.5	.5
	2	28	14.0	14.0	14.5
	3	3	1.5	1.5	16.0
	4	79	39.5	39.5	55.5
	5	89	44.5	44.5	100.0
	Total	200	100.0	100.0	

2. Feedback Mechanism [AI-generated content summarizing has improved my capacity to extract essential ideas from difficult research articles, which has improved my writing comprehensions.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	88	44.0	44.0	50.0
	5	100	50.0	50.0	100.0
	Total	200	100.0	100.0	

2. Feedback Mechanism [Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	108	54.0	54.0	60.0
	5	80	40.0	40.0	100.0
	Total	200	100.0	100.0	

2. Feedback Mechanism [AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	1	.5	.5	5.5
	4	86	43.0	43.0	48.5
	5	103	51.5	51.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.4.3 Frequencies of Usage Frequency

```
FREQUENCIES
VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayoutlinestosucce
ssfullya

@3.UsageFrequencyIexamineandenhanceallmyworkusingAIpoweredgramma

@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnologiestoass

@3.UsageFrequencyIutilizelanguagetranslationAItoaccessacademicli

@3.UsageFrequencyIutilizeAItoolstoassistmeintailoringthestyleand
  /STATISTICS=MEAN MEDIAN MODE SUM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 14:18:12
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.

Syntax		FREQUENCIES VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayo utlinestosuccessfullya
		@3.UsageFrequencyIexamineandenhanceallmyworkusingAI poweredgramma
		@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnol ogiestoass
		@3.UsageFrequencyIutilizelanguagetranslationAItoaccessac ademicli
		@3.UsageFrequencyIutilizeAItoolstoassistmeintailoringthesty leand /STATISTICS=MEAN MEDIAN MODE SUM /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Statistics

		3. Usage Frequency [I utilize AI-generated essay outlines to successfully arrange my ideas before writing]	3. Usage Frequency [I examine and enhance all my work using AI powered grammar and spelling checkers]	3. Usage Frequency [I use AI-based plagiarism detection technologies to assure the originality of my academic writing.]	3. Usage Frequency [I utilize language translation AI to access academic literature written in languages other than my native language.]	3. Usage Frequency [I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.]
N	Valid	200	200	200	200	200
	Missing	0	0	0	0	0
Mean		4.25	4.27	4.32	4.14	4.13
Median		4.00	4.00	4.00	4.00	4.00
Mode		4	4	4	5	4
Sum		849	853	864	827	826

Frequency Table

3. Usage Frequency [I utilize AI-generated essay outlines to successfully arrange my ideas before writing]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	32	16.0	16.0	16.0
	4	87	43.5	43.5	59.5
	5	81	40.5	40.5	100.0
	Total	200	100.0	100.0	

3. Usage Frequency [I examine and enhance all my work using AI powered grammar and spelling checkers]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	10	5.0	5.0	5.0
	3	2	1.0	1.0	6.0
	4	113	56.5	56.5	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

3. Usage Frequency [I use AI-based plagiarism detection technologies to assure the originality of my academic writing.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	15	7.5	7.5	7.5
	4	106	53.0	53.0	60.5
	5	79	39.5	39.5	100.0
	Total	200	100.0	100.0	

3. Usage Frequency [I utilize language translation AI to access academic literature written in languages other than my native language.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	27	13.5	13.5	13.5
	3	4	2.0	2.0	15.5
	4	84	42.0	42.0	57.5
	5	85	42.5	42.5	100.0
	Total	200	100.0	100.0	

3. Usage Frequency [I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	15	7.5	7.5	16.0
	4	93	46.5	46.5	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

Appendix 4.1.4.4 Frequencies of Hedonic Motivation

```
FREQUENCIES
VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignifican
tlyinaca

@4.HedonicMotivationAItoolscanaugmentmylearningbyprovidingtailor

@4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefrequentlydue

@4.HedonicMotivationAItechnologyprovideessentialtoolsandresource

@4.HedonicMotivationAItoolscanhelpandleadmewithavarietyofadminis
  /STATISTICS=MEAN MEDIAN MODE SUM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.

Syntax		FREQUENCIES VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignificantlyinaca @4.HedonicMotivationAItoolscanaugmentmylearningbyprovidingtailor @4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefrequentlydue @4.HedonicMotivationAItechnologyprovideessentialtoolsandresource @4.HedonicMotivationAItoolscanhelpandleadmewithavarietyofadminis /STATISTICS=MEAN MEDIAN MODE SUM /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Statistics

		4. Hedonic Motivation [AI tools enhanced my enjoyment significantly in academic.]	4. Hedonic Motivation [AI tools can augment my learning by providing tailored and adaptable learning experience]	4. Hedonic Motivation [I am inclined to utilize AI tools more frequently due to sense of motivation.]	4. Hedonic Motivation [AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.]	4. Hedonic Motivation [AI tools can help and lead me with a variety of administrative task to make my learning better.]
N	Valid	200	200	200	200	200
	Missing	0	0	0	0	0
Mean		4.20	4.28	4.15	4.19	4.34
Median		4.00	4.00	4.00	4.00	4.00
Mode		4	4	4	4	4

Sum	840	855	829	837	868

Frequency Table

4. Hedonic Motivation [AI tools enhanced my enjoyment significantly in academic.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	30	15.0	15.0	15.0
	4	100	50.0	50.0	65.0
	5	70	35.0	35.0	100.0
	Total	200	100.0	100.0	

4. Hedonic Motivation [AI tools can augment my learning by providing tailored and adaptable learning experience]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	28	14.0	14.0	14.0
	4	89	44.5	44.5	58.5
	5	83	41.5	41.5	100.0
	Total	200	100.0	100.0	

4. Hedonic Motivation [I am inclined to utilize AI tools more frequently due to sense of motivation.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	12	6.0	6.0	14.5
	4	96	48.0	48.0	62.5
	5	75	37.5	37.5	100.0
	Total	200	100.0	100.0	

4. Hedonic Motivation [AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	17	8.5	8.5	8.5
	3	11	5.5	5.5	14.0
	4	90	45.0	45.0	59.0
	5	82	41.0	41.0	100.0
	Total	200	100.0	100.0	

4. Hedonic Motivation [AI tools can help and lead me with a variety of administrative task to make my learning better.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	12	6.0	6.0	6.0
	4	108	54.0	54.0	60.0
	5	80	40.0	40.0	100.0
	Total	200	100.0	100.0	

Appendix 4.1.4.5 Frequencies of Hedonic Motivation

```
FREQUENCIES
VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmyabilitytowrite
clearand

PerceivedProficiencyUsingAIwritingtoolshasimprovedtheclarityando

PerceivedProficiencyIfindAIwritingtoolstobemoreefficientinidenti

PerceivedProficiencyIperceivemyunderstandingofgrammaticalrulesan
  /STATISTICS=MEAN MEDIAN MODE SUM
  /ORDER=ANALYSIS.
```

Frequencies

Notes

Output Created		05-APR-2024 14:42:20
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.

Syntax		FREQUENCIES VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmyabilitytowriteclearand
		
		PerceivedProficiencyUsingAIwritingtoolshasimprovedtheclarityando
		
		PerceivedProficiencyIfindAIwritingtoolstobemoreefficientinidenti
		
		PerceivedProficiencyIperceivemyunderstandingofgrammaticalrulesan
		  /STATISTICS=MEAN MEDIAN MODE SUM
		  /ORDER=ANALYSIS.

Resources	Processor Time	00:00:00.02
	Elapsed Time	00:00:00.01

Statistics

		Perceived Proficiency [I feel more confident in my ability to write clear and concise academic prose.]	Perceived Proficiency [Using AI writing tools has improved the clarity and organization of my academic writing]	Perceived Proficiency [I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.]	Perceived Proficiency [I perceive my understanding of grammatical rules and proper sentence structure to have improved]
N	Valid	200	200	200	200
	Missing	0	0	0	0
Mean		4.54	4.52	4.49	4.45
Median		5.00	5.00	5.00	5.00
Mode		5	5	5	5
Sum		908	903	897	890

Frequency Table

Perceived Proficiency [I feel more confident in my ability to write clear and concise academic prose.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	11	5.5	5.5	5.5
	4	70	35.0	35.0	40.5
	5	119	59.5	59.5	100.0
	Total	200	100.0	100.0	

Perceived Proficiency [Using AI writing tools has improved the clarity and organization of my academic writing]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	11	5.5	5.5	5.5
	4	75	37.5	37.5	43.0
	5	114	57.0	57.0	100.0
	Total	200	100.0	100.0	

Perceived Proficiency [I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	11	5.5	5.5	5.5
	4	81	40.5	40.5	46.0
	5	108	54.0	54.0	100.0
	Total	200	100.0	100.0	

Perceived Proficiency [I perceive my understanding of grammatical rules and proper sentence structure to have improved]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.5	.5	.5
	3	12	6.0	6.0	6.5
	4	83	41.5	41.5	48.0
	5	104	52.0	52.0	100.0
	Total	200	100.0	100.0	

Appendix D: Reliability Test

Appendix 4.2.1.1 Reliability Analysis of Personalized Learning

```
RELIABILITY

/VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingtoolscansig
nificantl

@1.PersonalizedLearningAItoolscaneffectivelysuggestvocabularyand

@1.PersonalizedLearningUsingAItoolsforpersonalizedfeedbackonclar

@1.PersonalizedLearningRelyingonAItoolsforpersonalizedlearningco
  /SCALE('Personalized Learning') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		05-APR-2024 15:25:26
Comments		
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	Active Dataset	DataSet1
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax	RELIABILITY
	/VARIABLES=@1.PersonalizedLearningPersonalizedAIwritingt oolscansignificantl
	@1.PersonalizedLearningAItoolscaneffectivelysuggestvocabul aryand
	@1.PersonalizedLearningUsingAItoolsforpersonalizedfeedbac konclar
	@1.PersonalizedLearningRelyingonAItoolsforpersonalizedlear ningco
	/SCALE('Personalized Learning') ALL
	/MODEL=ALPHA
	/STATISTICS=DESCRIPTIVE SCALE
	/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: Personalized Learning

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.761	4

Item Statistics

	Mean	Std. Deviation	N
1. Personalized Learning [Personalized AI writing tools can significantly improve my grammar and mechanics.]	4.49	.763	200
1. Personalized Learning [AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.]	4.08	.763	200
1. Personalized Learning [Using AI tools for personalized feedback on clarity, conciseness, and organization makes my writing process more efficient and effective.]	4.26	.687	200
1. Personalized Learning [Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.]	4.30	.742	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Personalized Learning [Personalized AI writing tools can significantly improve my grammar and mechanics.]	12.63	3.321	.428	.775
1. Personalized Learning [AI tools can effectively suggest vocabulary and sentence structures that enhance my writing style and originality.]	13.04	2.758	.692	.627

1. Personalized Learning [Using AI tools for personalized feedback on clarity, conciseness, and organization makes my writing process more efficient and effective.]	12.86	3.240	.558	.706
1. Personalized Learning [Relying on AI tools for personalized learning could increase my ability to develop critical thinking and independent writing skills.]	12.82	3.056	.573	.696

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.11	5.093	2.257	4

Appendix 4.2.1.2 Reliability Analysis of Feedback Mechanism

```
RELIABILITY

/VARIABLES=@2.FeedbackMechanismAIpoweredgrammarandspellingchecksha
veassiste

@2.FeedbackMechanismAIbasedplagiarismdetectionsystemshaveraisedm

@2.FeedbackMechanismAIgeneratedcontentsummarizinghasimprovedmyca

@2.FeedbackMechanismUsingAIwritingaidshasincreasedtheclarityandc

@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpedmearrangem
  /SCALE('Feedback Mechanism') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		05-APR-2024 15:45:31
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		/VARIABLES=@2.FeedbackMechanismAIpoweredgrammaran dspellingcheckshaveassiste
		@2.FeedbackMechanismAIbasedplagiarismdetectionsystemsh averaisedm
		@2.FeedbackMechanismAIgeneratedcontentsummarizinghasi mprovedmyca
		@2.FeedbackMechanismUsingAIwritingaidshasincreasedthecl arityandc
		@2.FeedbackMechanismAIgeneratedessayoutlineshavehelpe dmearrangem
		/SCALE('Feedback Mechanism') ALL
		/MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE
		/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: Feedback Mechanism

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.837	5

Item Statistics

	Mean	Std. Deviation	N
2. Feedback Mechanism [AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.]	4.15	1.001	200
2. Feedback Mechanism [AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing]	4.14	1.026	200
2. Feedback Mechanism [AI-generated content summarizing has improved my capacity to extract essential ideas from difficult research articles, which has improved my writing comprehensions.]	4.39	.749	200
2. Feedback Mechanism [Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.]	4.29	.727	200
2. Feedback Mechanism [AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.]	4.41	.745	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted

2. Feedback Mechanism [AI-powered grammar and spelling checks have assisted me in identifying and correcting writing errors, which has contributed to my writing ability growth.]	17.23	6.457	.733	.777
2. Feedback Mechanism [AI-based plagiarism detection systems have raised my understanding of academic integrity and the value of uniqueness in writing]	17.24	6.686	.651	.806
2. Feedback Mechanism [AI-generated content summarizing has improved my capacity to extract essential ideas from difficult research articles, which has improved my writing comprehensions.]	16.99	7.834	.667	.799
2. Feedback Mechanism [Using AI writing aids has increased the clarity and coherence of my works, favorably improving my writing style.]	17.09	7.757	.717	.788
2. Feedback Mechanism [AI-generated essay outlines have helped me arrange my ideas more efficiently and enhance the organization of my work.]	16.97	8.536	.482	.842

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.38	11.190	3.345	5

Appendix 4.2.1.3 Reliability Analysis of Usage Frequency

```
RELIABILITY

/VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayoutlinestosucc
essfullya

@3.UsageFrequencyIexamineandenhanceallmyworkusingAIpoweredgramma

@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnologiestoass

@3.UsageFrequencyIutilizelanguagetranslationAItoaccessacademicli

@3.UsageFrequencyIutilizeAItoolstoassistmeintailoringthestyleand
  /SCALE('Usage Frequency') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		/VARIABLES=@3.UsageFrequencyIutilizeAIgeneratedessayoutlines tosuccessfullya
		@3.UsageFrequencyIexamineandenhanceallmyworkusingAIpowere dgramma
		@3.UsageFrequencyIuseAIbasedplagiarismdetectiontechnologiesto ass
		@3.UsageFrequencyIutilizelanguagetranslationAItoaccessacademic li
		@3.UsageFrequencyIutilizeAItoolstoassistmeintailoringthestyleand /SCALE('Usage Frequency') ALL /MODEL=ALPHA /STATISTICS=DESCRIPTIVE SCALE /SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: Usage Frequency

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.840	5

Item Statistics

	Mean	Std. Deviation	N
3. Usage Frequency [I utilize AI-generated essay outlines to successfully arrange my ideas before writing]	4.25	.712	200
3. Usage Frequency [I examine and enhance all my work using AI powered grammar and spelling checkers]	4.27	.719	200
3. Usage Frequency [I use AI-based plagiarism detection technologies to assure the originality of my academic writing.]	4.32	.608	200
3. Usage Frequency [I utilize language translation AI to access academic literature written in languages other than my native language.]	4.14	.986	200
3. Usage Frequency [I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.]	4.13	.881	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
3. Usage Frequency [I utilize AI-generated essay outlines to successfully arrange my ideas before writing]	16.85	6.490	.713	.792
3. Usage Frequency [I examine and enhance all my work using AI powered grammar and spelling checkers]	16.83	6.906	.572	.826

3. Usage Frequency [I use AI-based plagiarism detection technologies to assure the originality of my academic writing.]	16.78	7.803	.416	.859
3. Usage Frequency [I utilize language translation AI to access academic literature written in languages other than my native language.]	16.96	5.024	.812	.757
3. Usage Frequency [I utilize AI tools to assist me in tailoring the style and tone of my essays to certain academic criteria.]	16.97	5.672	.747	.777

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.10	9.584	3.096	5

Appendix 4.2.1.4 Reliability Analysis of Hedonic Motivation

```
RELIABILITY

/VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignifica
ntlyinaca

@4.HedonicMotivationAItoolscanaugmentmylearningbyprovidingtailor

@4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefrequentlydue

@4.HedonicMotivationAItechnologyprovideessentialtoolsandresource

@4.HedonicMotivationAItoolscanhelpandleadmewithavarietyofadminis
  /SCALE('Hedonic Motivation') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		05-APR-2024 15:48:03
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	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		/VARIABLES=@4.HedonicMotivationAItoolsenhancedmyenjoymentsignificantlyinaca
		@4.HedonicMotivationAItoolscanaugmentmylearningbyprovidingtailor
		@4.HedonicMotivationIaminclinedtoutilizeAItoolsmorefrequentlydue
		@4.HedonicMotivationAItechnologyprovideessentialtoolsandresource
		@4.HedonicMotivationAItoolscanhelpandleadmewithavarietyofadminis
		/SCALE('Hedonic Motivation') ALL
		/MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE
		/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.00

Scale: Hedonic Motivation

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.865	5

Item Statistics

	Mean	Std. Deviation	N
4. Hedonic Motivation [AI tools enhanced my enjoyment significantly in academic.]	4.20	.680	200
4. Hedonic Motivation [AI tools can augment my learning by providing tailored and adaptable learning experience]	4.28	.694	200
4. Hedonic Motivation [I am inclined to utilize AI tools more frequently due to sense of motivation.]	4.15	.870	200
4. Hedonic Motivation [AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.]	4.19	.880	200
4. Hedonic Motivation [AI tools can help and lead me with a variety of administrative task to make my learning better.]	4.34	.588	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
4. Hedonic Motivation [AI tools enhanced my enjoyment significantly in academic.]	16.95	6.193	.743	.825

4. Hedonic Motivation [AI tools can augment my learning by providing tailored and adaptable learning experience]	16.87	6.295	.687	.837
4. Hedonic Motivation [I am inclined to utilize AI tools more frequently due to sense of motivation.]	17.00	5.457	.727	.829
4. Hedonic Motivation [AI technology provide essential tools and resources that augment my learning experience, thereby enhancing my self-confidence in academic writing.]	16.96	5.285	.769	.817
4. Hedonic Motivation [AI tools can help and lead me with a variety of administrative task to make my learning better.]	16.81	7.102	.549	.868

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
21.15	9.170	3.028	5

Appendix 4.2.1.5 Reliability Analysis of Perceived Proficiency

```
RELIABILITY

/VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmyabilitytowrit
eclearand

PerceivedProficiencyUsingAIwritingtoolshasimprovedtheclarityando

PerceivedProficiencyIfindAIwritingtoolstobemoreefficientinidenti

PerceivedProficiencyIperceivemyunderstandingofgrammaticalrulesan
  /SCALE('Proficiency') ALL
  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
```

Reliability

Notes

Output Created		05-APR-2024 15:48:57
Comments		
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	Split File	<none>
	N of Rows in Working Data File	200
	Matrix Input	
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data for all variables in the procedure.

Syntax		RELIABILITY
		/VARIABLES=PerceivedProficiencyIfeelmoreconfidentinmyability towriteclearand
		PerceivedProficiencyUsingAIwritingtoolshasimprovedtheclarity ando
		PerceivedProficiencyIfindAIwritingtoolstobemoreefficientinidenti
		PerceivedProficiencyIperceivemyunderstandingofgrammaticalr ulesan
		/SCALE('Proficiency') ALL
		/MODEL=ALPHA
		/STATISTICS=DESCRIPTIVE SCALE
		/SUMMARY=TOTAL.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

Scale: Proficiency

Case Processing Summary

		N	%
Cases	Valid	200	100.0
	Excluded[a]	0	.0
	Total	200	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.761	4

Item Statistics

	Mean	Std. Deviation	N
Perceived Proficiency [I feel more confident in my ability to write clear and concise academic prose.]	4.54	.600	200

Perceived Proficiency [Using AI writing tools has improved the clarity and organization of my academic writing]	4.52	.601	200
Perceived Proficiency [I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.]	4.49	.601	200
Perceived Proficiency [I perceive my understanding of grammatical rules and proper sentence structure to have improved]	4.45	.632	200

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Perceived Proficiency [I feel more confident in my ability to write clear and concise academic prose.]	13.45	2.078	.589	.690
Perceived Proficiency [Using AI writing tools has improved the clarity and organization of my academic writing]	13.47	2.210	.495	.739
Perceived Proficiency [I find AI writing tools to be more efficient in identifying and addressing errors in my academic writing.]	13.50	2.171	.522	.725
Perceived Proficiency [I perceive my understanding of grammatical rules and proper sentence structure to have improved]	13.54	1.938	.636	.662

Scale Statistics

Mean	Variance	Std. Deviation	N of Items
17.99	3.457	1.859	4

Appendix E: Multiple Linear Regression Analysis

Appendix 4.3.1 Multiple Linear Regression Analysis of Research

```
COMPUTE PL=(PL1 + PL2 + PL3 + PL4)/4.
EXECUTE.
COMPUTE FM=(FM1 + FM2 + FM3 + FM4 + FM5)/5.
EXECUTE.
COMPUTE UF=(UF1 + UF2 + UF3 + UF4 + UF5)/5.
EXECUTE.
COMPUTE HM=(HM1 + HM2 + HM3 + HM4 + HM5)/5.
EXECUTE.
COMPUTE AWP=(AWP1 + AWP2 + AWP3 + AWP4)/4.
EXECUTE.
REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA COLLIN TOL
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT AWP
  /METHOD=ENTER PL FM UF HM
  /SCATTERPLOT=(*ZPRED ,*ZRESID)
  /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID)
  /CASEWISE PLOT(ZRESID) OUTLIERS(3).
```

Regression

Notes

Output Created		13-APR-2024 21:35:27
Comments		
Input	Data	C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav
	Active Dataset	DataSet1
	Filter	<none>
	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	200
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.

	Cases Used	Statistics are based on cases with no missing values for any variable used.
Syntax		REGRESSION /MISSING LISTWISE /STATISTICS COEFF OUTS R ANOVA COLLIN TOL /CRITERIA=PIN(.05) POUT(.10) /NOORIGIN /DEPENDENT AWP /METHOD=ENTER PL FM UF HM /SCATTERPLOT=(*ZPRED ,* ZRESID) /RESIDUALS DURBIN HISTOGRAM(ZRESID) NORMPROB(ZRESID) /CASEWISE PLOT(ZRESID) OUTLIERS(3).
Resources	Processor Time	00:00:01.91
	Elapsed Time	00:00:00.66
	Memory Required	5024 bytes
	Additional Memory Required for Residual Plots	632 bytes

[DataSet1] C:\Users\Shi Zhe\OneDrive\Desktop\SZ SPSS Result\SZ Balance test.sav

Variables Entered/Removed[a]

Model	Variables Entered	Variables Removed	Method
1	HM, FM, PL, UF[b]	.	Enter

a. Dependent Variable: AWP

b. All requested variables entered.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.703[a]	.494	.483	.33418	1.841

a. Predictors: (Constant), HM, FM, PL, UF

b. Dependent Variable: AWP

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	21.222	4	5.305	47.508	.000[b]
	Residual	21.777	195	.112		
	Total	42.999	199			

a. Dependent Variable: AWP

b. Predictors: (Constant), HM, FM, PL, UF

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.015	.184		16.357	.000		
	PL	.372	.106	.452	3.516	.001	.157	6.362
	FM	.432	.091	.622	4.726	.000	.150	6.669
	UF	.197	.110	.263	1.794	.074	.121	8.268
	HM	-.660	.100	-.860	-6.622	.000	.154	6.490

a. Dependent Variable: AWP

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	(Constant)	Variance Proportions			
					PL	FM	UF	HM
1	1	4.976	1.000	.00	.00	.00	.00	.00
	2	.015	18.322	.86	.00	.03	.01	.01
	3	.005	31.078	.02	.00	.32	.01	.30
	4	.003	40.177	.08	.48	.01	.33	.01
	5	.001	64.939	.04	.51	.64	.64	.68

a. Dependent Variable: AWP

Casewise Diagnosticsª

Case Number	Std. Residual	AWP	Predicted Value	Residual
31	3.048	4.50	3.4815	1.01849

a. Dependent Variable: AWP

Residuals Statisticsª

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.2574	5.0275	4.4975	.32656	200
Residual	-.99039	1.01849	.00000	.33080	200
Std. Predicted Value	-3.797	1.623	.000	1.000	200
Std. Residual	-2.964	3.048	.000	.990	200

a. Dependent Variable: AWP

Charts

Histogram
Dependent Variable: AWP

Mean = 6.43E-16
Std. Dev. = 0.990
N = 200

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: AWP

Scatterplot
Dependent Variable: AWP