

A Study of ChatGPT and Writing Through the Lens of Social Cognitive Theory

Nurul Syafieqah Jaafar¹, Nurhilleny Rosly², Najwa Zulkifli³, Noor Hanim Rahmat⁴, Zarina Razlan⁵

Academy of Language Studies, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia

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ABSTRACT

Academic writing is perceived as a challenging task among ESL students as it involves cognitive, metacognitive, and self-regulatory skills. New norms of support in writing processes have been introduced with the emergence of artificial intelligence tools, such as ChatGPT. Therefore, grounded in Albert Bandura's Social Cognitive Theory, this quantitative study explores how environmental (including these environmental AI shifts), personal cognitive, and behavioural factors influence the students' academic writing processes. It aims to investigate if there are significant relationships among the three factors based on demographic variables, namely, genders, academic disciplines, and linguistic proficiencies. In addition, the study also examines ESL students' perceptions of how these factors influence their writing processes. To achieve these, a survey was conducted among 165 ESL students from a Malaysian public university. The data, which was obtained through a 5-point Likert scale questionnaire, was analysed using SPSS. The analyses indicate a significant relationship between personal factors and gender, and different academic disciplines. On the other hand, linguistic proficiencies show a significant relationship across environmental and personal factors. Furthermore, students perceived environmental factors, particularly the use of ChatGPT, as a tool that encourages critical thinking and improves academic performance. The findings also revealed that the students relied on metacognitive and cognitive writing strategies and reflected their high resilience and effort regulation despite showing a lower consistency in regular writing practice. This study offers a foundation for more focused instructional interventions in higher education.

Keywords: ChatGPT, Academic Writing, Environmental Factors, Personal Factors, Behavioural Factors, Social Cognitive Theory

INTRODUCTION

Background of Study

Academic writing is widely recognised as one of the most complex tasks among English as a Second Language (ESL) students (Xu & Jumaat, 2024). It involves an integration of the students' linguistic knowledge, critical thinking skills, and self-regulation simultaneously. Linguistically, writers must manage language mechanics, including using precise vocabulary, creating sentences that show relationships between ideas, and adhering to formal conventions and correct citation format. In addition, academic writing also requires writers to evaluate and synthesise literature to make a strong argument. Because this process demands a great amount of effort, writers must be able to consciously oversee their own behaviours and emotional states. They need to plan what they want to write, monitor progress, make metacognitive adjustments, and manage psychological barriers like writing anxiety, perfectionism, and procrastination. Consequently, ESL students often find academic writing profoundly challenging, requiring both linguistic proficiency and highly specific writing strategies (Xu & Jumaat, 2024).

The emergence of artificial intelligence technologies, including ChatGPT has helped ESL students with their academic writing. Since its launch in November 2022, ChatGPT has become a tutor and a tool for higher education ESL students (Pham et al., 2025). It provides feedback and helps them in generating ideas for their writing. students' queries can be responded to by ChatGPT in textual, audio, or visual data forms within a few seconds (Adeshola & Adepoju, 2023).

To understand how ESL students navigate this new AI-mediated writing environment, researchers must look beyond mere technological utility and examine the underlying cognitive and behavioural mechanisms. Albert Bandura's Social Cognitive Theory (SCT) provides an ideal theoretical framework for this exploration, particularly through its model of triadic reciprocal determinism. SCT suggests that human functioning is governed by three interdependent determinants, namely, personal factors (such as metacognitive, cognitive abilities), behavioural factors (writing and self-regulation strategies), and environmental factors (the external writing context, now heavily mediated by AI tools such as ChatGPT).

Within this framework, ChatGPT does not exist merely as a static external tool, rather, it functions as a highly interactive environmental factor that actively influences and is influenced by the students' personal factors and writing behaviours (Bandura, 1986; Deep, 2025). ESL students interact with ChatGPT to resolve a complex syntactic issue or brainstorm ideas. This environmental intervention can directly change their internal affective state, potentially reducing writing anxiety and boosting their writing self-efficacy (Bandura, 1986; Hsu, 2025; Shen & Tao, 2024). This shift affects the behavioural strategies the students use, such as how persistently they self-regulate, monitor, and revise their work (Bandura, 1986; Diasti, 2026). On the other hand, how well students control the AI environment to produce valuable academic feedback depends on their distinct self-regulation techniques and prompt-engineering behaviours (Diasi, 2026; Hsu, 2025).

While early research acknowledges that ChatGPT helps ESL students generate ideas and manage linguistic mechanics (Adeshola & Adepoju, 2023; Pham et al., 2025), there remains a gap in understanding how this AI tool changes the self-regulatory loop present in academic writing. Grounding this study in Bandura's SCT allows for a deeper investigation on how ESL students interact with ChatGPT to shape their writing self-efficacy and transform their self-regulated writing strategies.

Statement of Problem

Writing skills can be considered as complex and recursive skills as it involves continuous critical thinking process especially in planning and transferring ideas into meaningful text (Sagredo-Ortiz & Kloss, 2025). The recent advancement and developments of Generative AI tools such as ChatGPT, has introduced a dynamic change in the academic settings. During its initial emergence in 2024, many educators were concerned about misinformation, bias and data privacy (Rawas, 2024). Current education technology and language learning research has examined the quick use of Generative AI, especially ChatGPT, in classroom context using Bandura's Social Cognitive Theory (SCT). Under this framework, the writing process is governed by a triadic reciprocal determinism where human behavior, environmental influence and personal factors continuously interact and influence one another. However, the majority of current literature documents these triadic notes in complete isolation. For example, utility-centered research focuses on how ChatGPT functions as a means through which students can receive the benefits of an external environmental affordance like reducing cognitive load (Sweller, 2011). This fragmented focus is further supported by Khairuddin et al., (2025) stating that there is limited exploration on the interaction between cognitive, behavioral and environmental factors in shaping students' writing strategies.

The need for this study arises from a lack of conceptual consistency surrounding the contemporary state of human interaction using Generative AI. From the Social Cognitive Theory, a student's environment impacts their thought and behaviour as well as the thoughts and behaviour of their environment. It is important to study this effect due to the increasing empirical evidence such as Alih et al. and Khairuddin et al., (2025), that interacting with Generative AI can create complex psychological adjustments to how students perceive their own writing capabilities. This study will also help educators to better regulate AI usage and provide opportunity for a fundamental shift in the cognitive and behavioral strategies necessary for students to achieve real writing autonomy.

Research Objectives and Research Questions

This study is done to explore environmental, personal, and behavioural factors in writing. Specifically, this study is done to answer the following questions;

1. Is there a significant difference for environmental, personal, and behavioural factors across gender?

H₀₁: There is no significant difference for environmental, personal, and behavioural factors across gender.

2. Is there a significant difference for environmental, personal, and behavioural factors across disciplines?

H₀₂: There is no significant difference for environmental, personal, and behavioural factors across disciplines.

3. Is there a significant difference for environmental, personal, and behavioural factors across linguistic proficiencies?

H₀₃: There is no significant difference for environmental, personal, and behavioural factors across linguistic proficiencies.

4. How do students perceive environmental factors in writing?

5. How do students perceive personal factors in writing?

6. How do students perceive behavioural factors in writing?

7. Is there a significant relationship between all factors in writing?

H₀₄: There is no significant relationship between all factors in writing.

LITERATURE REVIEW

Theoretical Framework of the Study

Social Cognitive Theory and Writing

In the concept of exchanging and expressing thoughts, Social Cognitive Theory (SCT) proposed by Bandura provides a comprehensive view in understanding how students reciprocate personal, behavioural and environmental factors when learning. According to Owunna, et al. (2025), whether in a conventional classroom or digital environment, students' academic performance is influenced by how well they effectively interact with their peers, teachers and the surrounding environment. Similarly, a study by Khairuddin et al. (2025) reaffirmed that students tend to integrate all these three components of Bandura's Social Cognitive Theory when writing, as the interaction between these elements assist them to develop persistence, social learning and better engagement in the classroom. It has proven that personal factors such as self-efficacy, motivation and cognitive awareness play an important role in developing students' confidence and writing ability. As mentioned by Alih et al. (2025), behavioural factors can be seen through students' writing practices, which includes their preparation prior to the writing, revision and editing before submission. students' take pride in their writing process by strategising accordingly, Therefore, it is fair to say that SCT is considered highly relevant, especially in understanding writing ability among students because it reflects how the reciprocal interaction among personal, behavioural and environmental factors contributes to students' writing development and their overall writing performance.

ChatGPT in Writing

ChatGPT in academic writing is best explained using Cognitive Load Theory. According to Cognitive Load Theory developed by John Sweller in 2011, learning becomes more effective when unnecessary mental effort is reduced. In academic writing, many students struggle to organise ideas, use appropriate grammar, and develop coherent arguments at the same time, which increases their cognitive load. The use of ChatGPT can help reduce this burden by providing immediate assistance during the writing process. For example, students can use ChatGPT to generate ideas, improve sentence structures, check grammar, and obtain examples of academic expressions. As a result, students are able to focus more on understanding content and developing critical thinking rather than spending excessive time on language-related difficulties. This support is especially useful for ESL students who may face additional challenges in vocabulary and sentence construction. However, while ChatGPT

can lower cognitive load and improve writing efficiency, students should still evaluate and edit the generated responses carefully to ensure originality, accuracy, and academic integrity in their work.

Past Studies

Many studies have been conducted to investigate the interaction of advanced computer technology and cognitive writing in modern language classrooms. One notable study by Khairuddin et al. (2025) explored how 142 Malaysian university ESL students perceived their academic writing processes through Social Cognitive Theory (SCT) by Bandura (2012) using a survey as the primary instrument. The results indicate that the students were making use of all five cognitive writing strategies (metacognitive, effort regulation, cognitive, social and affective), which enabled them to successfully tackle the structural and cognitive challenges associated with writing. This study shows that integrating socio-cognitive principles into instruction can increase strategy awareness and develop students' ability to be resilient writers. Therefore, writing strategy cannot be viewed as isolated skill but should taught together in relation to the students' personal, behavioral and environmental experiences.

A study was conducted by Yang et al. (2026) to investigate how artificial intelligence self-efficacy influences higher-order thinking skills and creative problem-solving in second language learning contexts. The respondents were 412 undergraduate students learning English as a second language. This quantitative survey using a 5-point Likert scale found that there is a direct relationship between the student's internal belief structure and how they behaved with AI. Students will evaluate themselves and determine whether they will engage in reflective practise with AI as opposed to simply copying what they found there. The implications of this study suggest that language instruction is only effective if it builds academic self-confidence through technology use because high AI self-efficacy promotes better engagement with students as well as greater depth and creativity in their work.

Next, a study by Alghamdi (2025) also looked at critical thinking and creative capacity but focused on the influence of self-efficacy and disciplinary differences. The respondents were undergraduate students with a sample size of 405. This research utilised a cross-sectional quantitative survey instrument. It was found that university students have different perceptions of generative AI when evaluated as rapid generators of ideas. Tools like ChatGPT are powerful to assist in rapidly generating ideas; however, students must apply their independent metacognitive thinking to the algorithms that generate ideas in order to make informed decisions on how to use those ideas. The implications of this study indicate that when students do not demonstrate active internal self-regulation, they will rely too much on the AI tools and create a passive shortcut instead of engaging in deep learning.

A study by Shen and Tao (2025) was done to investigate the effects of metacognitive strategies and AI-based writing self-efficacy on writing anxiety among English as a Foreign Language (EFL) learners within AI-assisted writing contexts. This research examined how self-regulation practices (including planning, monitoring, and evaluating) and technology-focused confidence intersect to influence negative emotional barriers like tension or fear during text production. The respondents consisted of 193 undergraduate EFL learners from northern China who completed three 5-point Likert scale instruments, namely Metacognitive Strategies Questionnaire, the AI-Based Writing Self-Efficacy Questionnaire, and the Writing Anxiety Questionnaire. Their structural equation modeling (SEM) analysis revealed that both metacognitive strategies and AI-based writing self-efficacy significantly reduce writing anxiety, with AI-based self-efficacy fully mediating the relationship between planning and anxiety while partially mediating the paths for monitoring and evaluating strategies. Furthermore, the study specifically highlighted that an over-reliance on digital tools often shifts student focus heavily toward surface-level language accuracy and grammar corrections. This can distract them from the deeper cognitive processes of organising text structure and generating original ideas. The implications of this study suggest that writing pedagogy must look beyond basic grammar correction and actively integrate metacognitive strategy training to ensure that AI tools are utilised as structural scaffolds for deep learning rather than superficial shortcuts for surface-level editing.

Next, Xu and Jumaat (2024) investigated the issues of how ChatGPT empowers academic writing strategies and how students perceive its technical assistance. Their research explores the applications, limitations, and operational implications of incorporating generative artificial intelligence within English academic writing for

non-native writers who face distinct challenges in language proficiency, content organisation, and critical thinking. The respondents were 60 university juniors majoring in English who participated in a mixed-methods research design utilising a China Standards of English (CSE)-based questionnaire followed by qualitative focus group interviews as the primary instruments. The findings indicate that ChatGPT helps students apply academic writing strategies more effectively by allowing them to comprehend research trends, generate initial writing outlines, enrich their composition content, synthesise literature, and refine their final papers. The implications of this study suggest that while ChatGPT-empowered writing can better equip language learners across the critical planning, composing, and revising stages of an essay, it remains absolutely vital for educators to train students to critically scrutinise the quality and accuracy of AI-generated text to maintain strict academic integrity and avoid passive learning shortcuts.

Moreover, Owunna et al. (2025) conducted a study on the issue of how social interaction influences academic performance through the lens of Social Cognitive Theory (SCT). This research explores the triadic reciprocity of personal, behavioural, and environmental factors to evaluate how these socio-cognitive constructs govern student engagement and collaborative learning outcomes. Because this research was designed as a conceptual and theoretical exploration of higher education environments, it did not utilise a traditional empirical sample pool of human respondents, instead leveraging an analytical literature framework as its primary research instrument. The findings indicate that active social interaction and structured peer learning serve as vital mechanisms for knowledge exchange, significantly improving student comprehension and knowledge retention rates compared to isolated learning environments. The implications of this study highlight that to optimise academic achievement, educational frameworks must intentionally apply social cognitive principles by structuring interactive peer environments that translate social interactions into enhanced student motivation and cognitive outcomes.

In short, the past studies mentioned above demonstrate that academic writing remains a challenging experience that technology alone cannot be its solution. Although research data showed that generative AI tools do provide an effective solution to rapidly generate ideas, its success depends on the degree of effective internal self-regulation and the strategies that a student implements. However, there are limitations among these studies. While researchers are looking into cognitive changes or isolated pairs of Bandura's triad, there is a lack of data showing how these individual constructs relate at the same time and within one framework. Therefore, evaluation on how ChatGPT has continuously interacted with English language students has to be made in order to change their concrete and affective sub-strategies. This study fills in the gap by looking at these measures in an integrated and empirical framework.

Conceptual Framework of the Study

Figure 1. Conceptual Framework – Writing and ChatGPT through Social Cognitive Theory

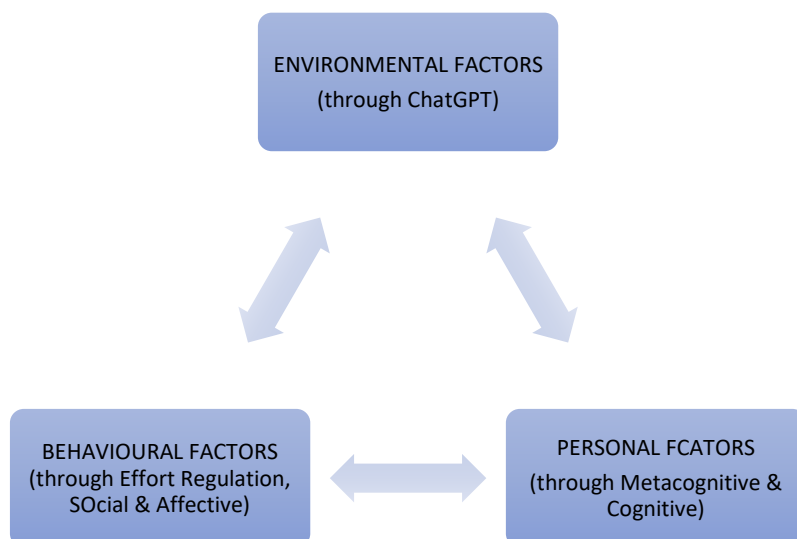


Figure 1 presents the conceptual framework of the study. The concept of this study is anchored by the Social

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

Cognitive theory by Bandura (2012) and merged with

According to Bandura (2012), learning occurs in a social context through dynamic, reciprocal interactions among three core components: personal factors (cognitive, affective, and biological events), behavioural patterns, and environmental influences. This interaction is known as reciprocal determinism; hence, the framework portrays the relationship between the three factors (Figure 1).

This study merges the concepts from the theory and corresponds the concepts to the studies by Raoofi et al. (2017) and Youssef et al. (2024). The idea of this framework is developed by the fact that the writing process using ChatGPT involves the writer using his/her personal and behavioural factors to write with the assistance of ChatGPT as the writing environment. The processes in writing are facilitated by the use of writing strategies (Khairuddin et al., 2021), and the strategies facilitate the writer to complete the writing task. Some strategies help students with the cognitive aspects, while some strategies help students with their metacognition (Rahmat, 2020). Additionally, Raoofi et al. (2017) state that some writing strategies include metacognitive, effort regulation, cognitive, social, and affective writing strategies.

The age of technology has encouraged writers to turn to ChatGPT to facilitate their writing tasks. According to Youssef et al. (2024), the use of ChatGPT can influence a person's critical thinking abilities, academic achievement, ChatGPT usage, and student engagement. This study also explores the relationship of all factors as shown in Figure 1.

METHODOLOGY

This quantitative study is done to explore writing and ChatGPT through SCT. A convenient sample of 165 participants responded to the survey. The instrument used is a 5-point Likert-scale survey and is rooted from Raoofi et al. (2017) and Youssef et al. (2024) to reveal the variables in Table 3 below. Table 1 below shows the categories used for the Likert scale; 1 is for Strongly Disagree, 2 is for Disagree, 3 is for Undecided, 4 is for Agree, and 5 is for Strongly Agree.

Table 1. Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations

1	Never
2	rarely
3	Sometimes
4	Often
5	Always

Table 2. Likert Scale Use

Section	Variable	Construct	No. of Items	Cronbach's Alpha
B	Personal Factors	Metacognitive	10	16(.893)
		Cognitive	6	
C	Behavioural Factors	Effort Regulation	4	11(.850)
		Social	4	
		Affective	3	
D	Environmental Factors	Critical thinking abilities	4	

		Academic achievement	4	
		ChatGPT usage	5	
		Student engagement	3	
				16(.926)
				43(.927)

Table 3. Distribution of Items in the Survey

Table 3 shows the distribution of items in the survey. Section B has 16 items on Personal Factors. Section C has 11 items on Behavioural Factors. Section D has 16 items Environmental Factors.

Table 4. Reliability Levels, Cronbach's Alpha Ranges, and Their Interpretations

Reliability Level	Cronbach's Alpha range	Interpretation
Excellent	0.9 and above	Indicates very high internal consistency
Good	0.80-0.89	Reflects strong internal consistency
Acceptable	0.70-0.79	Indicates acceptable internal consistency
Questionable	0.60-0.69	Reflects questionable internal consistency
Poor	Below 0.6	Indicates poor internal consistency

To determine the instrument's internal reliability, a reliability analysis is conducted. Table 4 above shows the distribution and interpretation of Cronbach's Alpha range. According to Ahmad et al. (2024), Cronbach's Alpha scores between 0.7 to 0.9 is considered acceptable to excellent.

Table 3 also shows the reliability of the survey. The analysis shows a Cronbach alpha of .893 for personal factors, .850 for behavioural factors, .926 for environmental factors. The overall Cronbach's alpha for all 43 items is .927, thus revealing a good reliability of the instrument used. Further analysis using SPSS is done to present findings to answer the research questions for this study.

FINDINGS

Demographic Analysis

According to Zienefuss et al. (2021), researchers report demographic data in percentages to establish sample representativeness and allow for generalisability to a larger population. The reporting also provides an overview of participants' characteristics. Percentages offer a clear and understandable picture of the sample makeup.

Table 5. Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	23%
		Female	77%
3	Academic Discipline	Science & Technology	53%
		Social Sciences & Humanities	47%
4	MUET Band	1.0-3.5	36%
		4.0-5.5	64%

Table 5 presents the demographic profile of the respondents. The data reveal that most of the respondents were female (77%), while 23% of them were male. In terms of academic discipline, 53% of the respondents were from Science & Technology domain, while the remaining 47% belonged to Social Sciences & Humanities.

Lastly, regarding the English language proficiency levels of the respondents, 64% of them achieved MUET bands between 4.0 and 5.5, while the remaining 36% scored within the 1.0 to 3.5 bands. Therefore, the majority of the respondents were considered more proficient, whereas the minority possessed lower proficiency.

Inferential Analysis

According to Shah (2024), there are three main functions of a T-test. Firstly, T-tests are done to compare means. This test is also done to determine if the average scores (mean) or values of two groups, or one group against a known value, are different enough to be considered statistically meaningful and are not just due to random chance. Secondly, a t-test is done to test hypotheses. Researchers use t-tests to test hypotheses about means, such as whether a new treatment significantly impacts a variable or if there's a difference in performance between two distinct groups. Lastly, T-test is used to identify significant differences. The output of a t-test provides a p-value (significance value). If this p-value is below a pre-determined threshold (often 0.05), it indicates a statistically significant difference, allowing researchers to conclude the populations from which their samples were drawn.

Findings for Gender

This section presents data to answer research question 1: Is there a significant difference for environmental, personal, and behavioural factors across gender?

H_{01} : There is no significant difference for environmental, personal, and behavioural factors across gender.

Table 6. T-Test for environmental, personal, and behavioural factors across gender

Group Statistics					
	Q1GENDER	N	Mean	Std. Deviation	Std. Error Mean
ENVIRONMENTAL_FACTORS	MALE	38	3.6316	.70708	.11470
	FEMALE	127	3.7244	.53824	.04776
PERSONAL_FACTORS	MALE	38	3.7270	.47873	.07766
	FEMALE	127	3.9498	.44516	.03950
BEHAVIOURAL_FACTORS	MALE	38	3.6603	.60031	.09738
	FEMALE	127	3.7173	.47628	.04226

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower Upper
ENVIRONMENTAL_FACTORS	Equal variances assumed	4.890	.028	-.864	163	.194	.389	-.09283	.10741	-.30492 .11926
	Equal variances not assumed			-.747	50.497	.229	.458	-.09283	.12425	-.34233 .15667
PERSONAL_FACTORS	Equal variances assumed	.066	.798	-2.660	163	.004	.009	-.22283	.08376	-.38823 -.05743
	Equal variances not assumed			-2.557	57.492	.007	.013	-.22283	.08713	-.39727 -.04839
BEHAVIOURAL_FACTORS	Equal variances assumed	3.150	.078	-.608	163	.272	.544	-.05696	.09377	-.24212 .12819
	Equal variances not assumed			-.537	51.712	.297	.594	-.05696	.10616	-.27001 .15609

A two-sample t-test was performed to test the relationship between environmental, personal, and behavioural factors across gender. Analysis showed that there is a significant relationship for personal factors ($p=0.009$) across gender. However, there are no significant relationships between environmental ($p=0.389$) and (c) behavioural factors ($p=0.544$) across gender.

Findings for Academic Disciplines

This section presents data to answer research question 2: Is there a significant difference for environmental, personal, and behavioural factors across academic disciplines?

H_{02} : There is no significant difference for environmental, personal, and behavioural factors across disciplines.

Table 7. T-Test for environmental, personal, and behavioural factors across academic disciplines

Group Statistics					
	Q2DIS	N	Mean	Std. Deviation	Std. Error Mean
ENVIRONMENTAL_FACTORS	S&T	88	3.7109	.58510	.06237
	SS,H,&B	77	3.6940	.57877	.06596
PERSONAL_FACTORS	S&T	88	3.9759	.44714	.04766
	SS,H,&B	77	3.8101	.46423	.05290
BEHAVIOURAL_FACTORS	S&T	88	3.7211	.51973	.05540
	SS,H,&B	77	3.6848	.49279	.05616

Independent Samples Test											
Levene's Test for Equality of Variances						t-test for Equality of Means					
		F	Sig.	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
ENVIRONMENTAL_FACTORS	Equal variances assumed	.024	.876	.187	163	.426	.852	.01694	.09084	-.16244	.19633
	Equal variances not assumed			.187	160.548	.426	.852	.01694	.09078	-.16233	.19622
PERSONAL_FACTORS	Equal variances assumed	.006	.939	2.334	163	.010	.021	.16579	.07103	.02553	.30605
	Equal variances not assumed			2.328	158.328	.011	.021	.16579	.07121	.02515	.30643
BEHAVIOURAL_FACTORS	Equal variances assumed	.090	.764	.459	163	.324	.647	.03630	.07917	-.12003	.19264
	Equal variances not assumed			.460	161.932	.323	.646	.03630	.07889	-.11948	.19209

A two-sample t-test was performed to test the relationship between environmental, personal, and behavioural factors across academic disciplines. Analysis showed that there is a significant relationship for personal factors ($p=0.021$) across academic disciplines. However, there are no significant relationships between environmental ($p=0.852$), and behavioural factors ($p=0.646$) across academic disciplines.

Findings for Linguistic Proficiencies

This section presents data to answer research question 3: Is there a significant difference for environmental, personal, and behavioural factors across linguistic proficiencies?

H_{03} : There is no significant difference for environmental, personal, and behavioural factors across linguistic proficiencies.

Table 8. T-Test for environmental, personal, and behavioural factors across linguistic proficiencies

Group Statistics					
	Q3MUETBand	N	Mean	Std. Deviation	Std. Error Mean
ENVIRONMENTAL_FACTORS	1-3.5	60	3.5406	.51356	.06630
	4-5.5	105	3.7958	.59812	.05837
PERSONAL_FACTORS	1-3.5	60	3.7563	.50797	.06558
	4-5.5	105	3.9798	.41335	.04034
BEHAVIOURAL_FACTORS	1-3.5	60	3.7045	.52441	.06770
	4-5.5	105	3.7039	.49793	.04859

Independent Samples Test											
Levene's Test for Equality of Variances						t-test for Equality of Means					
		F	Sig.	t	df	Significance One-Sided p	Significance Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
ENVIRONMENTAL_FACTORS	Equal variances assumed	.537	.465	-2.772	163	.003	.006	-.25521	.09208	-.43703	-.07339
	Equal variances not assumed			-2.889	138.650	.002	.004	-.25521	.08833	-.42986	-.08055
PERSONAL_FACTORS	Equal variances assumed	3.132	.079	-3.070	163	.001	.003	-.22351	.07281	-.36729	-.07974
	Equal variances not assumed			-2.903	103.675	.002	.005	-.22351	.07699	-.37620	-.07083
BEHAVIOURAL_FACTORS	Equal variances assumed	.583	.446	.008	163	.497	.994	.00065	.08216	-.16159	.16288
	Equal variances not assumed			.008	117.726	.497	.994	.00065	.08333	-.16438	.16568

A two-sample t-test was performed to test the relationship between environmental, personal, and behavioural factors across linguistic proficiencies. Analysis showed that there were significant relationships for environmental ($p=0.006$) and personal factors ($p=0.003$) across linguistic proficiencies. However, there is no significant relationship between behavioural factors ($p=0.994$) across linguistic proficiencies.

Descriptive Analysis

Why is there a need to report the mean and standard deviation? According to Vetter (2017), Mean (M) represents the average, or centre of a data set. Standard deviation (SD) indicates the typical distance of individual observations from the mean which shows the data's variability or spread. A low SD means the data points are clustered close to the mean, whereas a high SD indicates they are more spread out. It is good to have a high SD.

Findings for Environmental Factors

This section presents data to answer research question 1: How do students perceive environmental factors in writing? In the context of this study this is measured by ChatGPT factors such as (i) critical thinking abilities, (ii) academic achievements, (ii) ChatGPT usage, and (iv) student engagement.

Table 9. Mean and Standard Deviation for Critical Thinking Abilities (CT)

ITEM	M	SD
CTQ1 I usually need clarification on the precision and reliability of information provided by ChatGPT, which enhances my critical thinking skills.	3.85	0.79
CTQ2 ChatGPT's responses made me doubt their validity, leading me to seek further clarification or evidence.	3.78	0.87
CTQ3 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.	3.93	0.80
CTQ4 I need clarification about the accuracy of ChatGPT's output, which often encourages me to evaluate the information and conduct additional research independently.	3.87	0.78

Table 9 presents the mean score for critical thinking abilities when using ChatGPT among the students. Q3 achieved the highest mean score of 3.93 which indicates that the students actively explored alternative viewpoints or sources of information when using ChatGPT to gain better understanding of the topic. This is followed by Q4 with a mean score of 3.87 which suggests that students evaluated the accuracy of ChatGPT and conducted additional research independently. Q1 obtained a mean score of 3.85 which shows that students usually sought further clarification to enhance their critical thinking skills. Finally, Q2 recorded a mean score of 3.78 which signifies that students questioned the validity of ChatGPT leading them to look for clarification or supporting evidence. Overall, the findings suggest that the use of ChatGPT motivated students to critically evaluate information and explore other alternatives before accepting the information provided.

Table 10. Mean and Standard Deviation for Academic Achievement (AA)

ITEM	M	SD
AAQ1 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.	3.71	0.78
AAQ2 ChatGPT brings innovative ideas that are ready to be shared with students.	3.75	0.75
AAQ3 Students can anticipate robust writing guidance from ChatGPT.	3.47	0.81
AAQ4 ChatGPT has improved my academic performance.	3.68	0.84

Table 10 presents the mean score for academic achievements when using ChatGPT among the students. Q2 has the highest mean score of 3.75 which shows that students agreed that ChatGPT brings innovative ideas. Next, Q1 obtained the second highest mean score of 3.7, which indicates that students explored alternative viewpoints or sources of information to reassure the comprehension of the topic. Q4 recorded a mean score of 3.68, which reflects

that ChatGPT contributed positively to the students' academic performance. Lastly, Q3 obtained the lowest mean score of 3.47, which reveals that students moderately agreed that they could anticipate robust writing guidance from ChatGPT. Conclusively, the findings imply that the use of ChatGPT contributed positively to students' academic achievement by supporting idea generation and improving academic performance.

Table 11. Mean and Standard Deviation for ChatGPT Usage (CU)

ITEM	M	SD
CUQ1 ChatGPT is a state-of-the-art writing model that is favourably used today.	3.72	0.84
CUQ2 Students seek help from ChatGPT's assistance in composing essays and articles.	3.61	0.81
CUQ3 ChatGPT helps students in English language translation.	3.68	0.94
CUQ4 Employing ChatGPT significantly improves human productivity.	3.58	0.90
CUQ5 The advent of ChatGPT marks a groundbreaking transformation in Natural Language Processing capabilities.	3.64	.90

Table 11 indicates that respondents generally held positive perceptions towards the use of ChatGPT in academic writing and language-related tasks, as reflected by the mean scores ranging from 3.58 to 3.72. Among the items, CUQ1, which states that ChatGPT is a state-of-the-art writing model favourably used today, recorded the highest mean score ($M = 3.72$, $SD = 0.84$), suggesting that most respondents agreed with this statement with relatively consistent responses. Similarly, respondents agreed that ChatGPT helps students in English language translation ($M = 3.68$, $SD = 0.94$) and that its emergence represents a groundbreaking transformation in Natural Language Processing capabilities ($M = 3.64$, $SD = 0.90$). In addition, students were found to seek assistance from ChatGPT in composing essays and articles ($M = 3.61$, $SD = 0.81$), indicating a favourable perception of its usefulness in writing activities. The item on ChatGPT improving human productivity obtained the lowest mean score, although it still reflected agreement among respondents ($M = 3.58$, $SD = 0.90$). Overall, the relatively low standard deviation values indicate that respondents' opinions were generally consistent across all items.

Table 12. Mean and Standard Deviation for Student Engagement (SE)

ITEM	M	SD
SEQ1 ChatGPT is more interactive, human-like, and engaging for the students.	3.52	0.91
SEQ2 ChatGPT increases confidence in my ability to conduct research/to search for materials	3.61	0.83
SEQ3 ChatGPT is easy to use and more engaging for me	3.85	0.81

The findings in Table 12 show that respondents generally had positive perceptions towards the use of ChatGPT in supporting engagement and confidence in learning activities. The highest mean score was recorded for SEQ3, which states that ChatGPT is easy to use and more engaging for students ($M = 3.85$, $SD = 0.81$). This indicates that most respondents strongly agreed that the platform is user-friendly and capable of creating a more engaging learning experience, with relatively consistent responses among participants. In addition, respondents agreed that ChatGPT increases their confidence in conducting research and searching for materials ($M = 3.61$, $SD = 0.83$), suggesting that students perceive the tool as helpful in academic tasks and information gathering. Meanwhile, the item stating that ChatGPT is more interactive, human-like, and engaging for students recorded the lowest mean score among the three items, although the result still reflected agreement from respondents ($M = 3.52$, $SD = 0.91$). Overall, the standard deviation values ranging from 0.81 to 0.91 indicate a moderate level of consistency in respondents' perceptions towards ChatGPT's usefulness and interactivity in learning and academic activities.

Findings for Personal Factors

This section presents data to answer research question 2: How do students perceive personal factors in writing? In the context of this study, this is measured by metacognitive and cognitive strategies.

Table 13. Mean and Standard Deviation for Metacognitive (MWS)

ITEM	M	SD
MWSQ1 I organise my ideas prior to writing.	3.79	0.74

MWSQ2 I revise my writing to make sure that it includes everything I want to discuss in my writing.	4.13	0.66
MWSQ3 I check my spelling.	4.25	0.76
MWSQ4 I check my writing to make sure it is grammatically correct.	4.16	0.74
MWSQ5 I evaluate and re-evaluate the ideas in my essay.	3.89	0.71
MWSQ6 I monitor and evaluate my progress in writing.	3.83	0.77
MWSQ7 I revise and edit an essay two or more times before I hand it in to my teacher.	4.01	0.78
MWSQ8 I go through the planning stages in my writing.	3.85	0.74
MWSQ9 I go through the drafting stages in my writing.	3.91	0.83
MWSQ10 I go through the revising and editing stages in my writing.	4.01	0.70

Table 13 presents the mean scores for all metacognitive strategies from item MWSQ1 to MWSQ10. It can be seen that the results are consistently high ranging from 3.79 to 4.25. This shows that students consider metacognitive strategies as one of the important personal characteristics in writing. The item that has the highest mean score is MWSQ3 ("I check my spelling") with a mean of 4.25 (SD = 0.78). Another item that comes second is MWSQ 4 ("I check my writing to make sure it is grammatically correct) with a mean of 4.16 (SD = 0.74). This may suggest that students also put an emphasis on proofreading or surface level editing. Apart from that, MWSQ1 ("I organise my idea prior to writing") has the lowest mean of 3.79 (SD = 0.74), which suggests that pre-writing organisation occurs at a high rate but a little less frequent than drafting and revising. Overall, the standard deviations across all items (between 0.66 to 0.83) are relatively low indicating strong agreement among students on their metacognitive strategy used.

Table 14. Mean and Standard Deviation for Cognitive (CWS)

ITEM	M	SD
CWSQ1 I use memorised grammatical elements such as singular and plural forms, verb tenses, prefixes and suffixes, etc, in my writing	3.58	0.79
CWSQ2 I put newly memorised vocabulary in my sentences.	3.47	0.80
CWSQ3 In order to generate ideas for my writing, I usually engage myself in brainstorming.	3.42	0.72
CWSQ4 I use different words that have the same meaning.	3.69	0.78
CWSQ5 I use my experiences and knowledge in my writing.	4.05	0.69
CWSQ6 I try to use effective linking words to ensure clear and logical relationship between sentences or paragraphs	3.93	0.71

Table 14 presents the mean score for cognitive writing strategies among the students. Q5 recorded the highest mean score of 4.05 which demonstrates that students tended to use their experiences and knowledge in their writing. This is followed by Q6 with a mean score of 3.93 which indicates that students used effective linking words to show clear and logical relationship between sentences or paragraphs. Next, Q4 obtained a mean score of 3.69 which implies that students also used different words with similar meanings in their writing. Q1 achieved a mean score of 3.58, which reflects that students applied memorised grammatical elements in their writing, while Q2 recorded a mean score of 3.47, which reveals that students moderately used newly memorised vocabulary in their sentences. Lastly, Q3 received the lowest mean score of 3.42, which indicates that students somewhat engaged in brainstorming activities to generate ideas for writing. In general, the findings illustrate that students frequently employed cognitive writing strategies in their writing.

Findings for Behavioural Factors

This section presents data to answer research question 3: How do students perceive behavioural factors in writing? In the context of this study, this is measured by effort regulation, social, and affective.

Table 15. Mean and Standard Deviation for Effort Regulation (ERS)

ITEM	M	SD
ERSQ1 I write a lot to develop my writing skills.	3.10	0.82

ERSQ2 I often work hard to do well in my writing even if I don't like English writing tasks.	3.77	0.82
ERSQ3 Even if the writing activities are difficult, I don't give up but try to engage in them.	4.06	0.67
ERSQ4 I concentrate as hard as I can when doing a writing task.	4.02	0.70

The findings indicate that respondents generally demonstrated positive engagement and perseverance in developing their writing skills. The highest mean score was recorded for ERSQ3, which states that students do not give up and continue engaging in writing activities even when the tasks are difficult ($M = 4.06$, $SD = 0.67$). This suggests that respondents showed a high level of determination and resilience in completing writing tasks, with responses being relatively consistent among participants. Similarly, respondents reported that they concentrated as hard as possible when doing writing tasks ($M = 4.02$, $SD = 0.70$), indicating strong focus and commitment towards writing activities. In addition, the item stating that students often work hard to do well in writing even if they do not like English writing tasks also obtained a relatively high mean score ($M = 3.77$, $SD = 0.82$), reflecting positive effort and persistence. However, the lowest mean score was recorded for ERSQ1, which states that students write a lot to develop their writing skills ($M = 3.10$, $SD = 0.82$). This suggests that although respondents generally showed perseverance and concentration in writing tasks, they were less consistent in practising writing regularly. Overall, the relatively low standard deviation values indicate moderate consistency in respondents' responses across all items.

Table 16. Mean and Standard Deviation for Social (SWS)

ITEM	M	SD
SWSQ1 In order to generate ideas for my writing, I usually discuss the writing topic with a friend or classmate.	3.60	0.90
SWSQ2 After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.	3.50	0.98
SWSQ3 I try to identify friends or classmates whom I can ask for help in my writing.	3.70	0.83
SWSQ4 When I have trouble writing my essay, I try to do it with my classmates or friends.	3.72	0.85

Findings in Table 16 show the mean scores for social writing strategies. SWSQ4 provided the highest mean of 3.72 ($SD = 0.85$) with the statement "When I have trouble writing an essay, I try to do it with my classmates or friends". This shows that the most common reason for peer collaboration is when students are experiencing issues when writing an essay. To further strengthen the outcome on social writing strategies, the item that comes second is SWSQ3 ("I try to identify friends or classmates whom I can ask for help in my writing."). This illustrates how students rely on their social network when they encounter any difficulty. In contrast, item SWSQ2 ("After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.") shows the lowest score ($M = 3.5$, $SD = 0.98$). Students may be looking for assistance of intervention after minimal review has been done.

Table 17. Mean and Standard Deviation for Affective (AWS)

ITEM	M	SD
AWSQ1 I try to write an essay in class with confidence and ease	3.53	0.75
AWSQ2 I try to relax whenever I feel afraid of writing.	3.79	0.74
AWSQ3 I encourage myself to write even when I am afraid of making mistakes	3.96	0.71

Table 17 presents the affective writing strategies among the students. Q3 has the highest mean score of 3.96 which demonstrates that students push themselves to write even though they are afraid to make mistakes. Followed by Q2 with a mean score of 3.79, which indicates that students try to calm themselves down when they get scared to write. Lastly, Q1 obtained the lowest mean score of 3.53 which shows that students attempted to write with confidence and ease. Generally, the findings signify that students moderately employed effective writing strategies to manage their emotions and maintain confidence when writing.

Exploratory Analysis

According to He (2024), correlation is a statistical technique that shows how strongly two variables are related

to each other or the degree of association between the two. It's a common tool for describing simple relationships without making a statement about cause and effect. This section presents data to answer the research question on correlation.

According to He (2024), the coefficient is significant at the .05 level and a positive correlation is measured on a 0.1 to 1.0 scale. A weak positive correlation would be in the range of 0.1 to 0.3, moderate positive correlation from 0.3 to 0.5, and strong positive correlation from 0.5 to 1.0.

Findings for the Relationship between All Factors in Writing

This section presents data to answer research question 4: Is there a significant relationship between all factors in writing?

H_{04} : There is no significant relationship between all factors in writing.

To determine if there is a significant association in the mean scores between all factors (environmental, personal, and behavioural factors) in writing, data is analysed using SPSS for correlations. Results are presented separately in Table 18 below.

Table 18. Correlation between All Factors in Writing

Correlations		Environmental Factors	Personal Factors	Behavioural Factors
Environmental Factors	Pearson Correlation	1	.313**	.253**
	Sig. (2-tailed)		<.001	.001
	N	165	165	165
Personal Factors	Pearson Correlation	.313**	1	.567**
	Sig. (2-tailed)	<.001		<.001
	N	165	165	165
Behavioural Factors	Pearson Correlation	.253**	.567**	1
	Sig. (2-tailed)	.001	<.001	
	N	165	165	165

** . Correlation is significant at the 0.01 level (2-tailed).

Table 18 shows there is a moderate positive association between environmental and personal factors ($r=.313^{**}$) and ($p=.000$). There is a strong, positive association between personal and behavioural factors ($r=.567^{**}$) and ($p=.000$). Lastly, there is a weak personal association between behavioural and environmental factors ($r=.253^{**}$) and ($p=.000$). Hence, the null hypothesis is rejected for H_{04} .

CONCLUSION

Summary of Findings and Discussions

The primary objective of this study was to examine academic writing and ChatGPT usage through the lens of Albert Bandura's Social Cognitive Theory (SCT), assessing how environmental, personal, and behavioural factors intersect among ESL undergraduate students.

The two-sample tests revealed that a student's background (their gender, academic discipline, or English language proficiency) strongly changes their inner mindset and how they interact with writing tools like ChatGPT. For both genders and academic disciplines, a significant relationship was found exclusively within personal factors. This indicates that internal cognitive states and writing self-efficacy beliefs are shaped by a student's gender and disciplinary background. This finding is in accordance with the study by Khairuddin et al. (2025), which claimed that using an AI-mediated writing environment causes complex internal psychological changes that vary significantly across academic fields.

On the other hand, linguistic proficiency demonstrated a strong correlation with both environmental and personal factors. This demonstrates that a student's basic language command serves as a crucial filter for how they perceive external technological tools and process cognitive load. This outcome is in accordance with the study by Xu and Jumaat (2024), who verified that foundational ESL proficiency directly governs the environmental resources and specific strategic scaffolds a learner requires to complete complex composition tasks.

The descriptive findings captured how students deployed personal and behavioural writing strategies within an AI-mediated environment. Within metacognitive strategies, students demonstrated the highest frequency in surface-level editing, such as checking spelling and grammar, but showed the lowest frequency in organising ideas before writing. This emphasis on surface-level accuracy rather than comprehensive planning is in accordance with the study by Shen and Tao (2025). It highlighted that contemporary ESL writers frequently over-rely on metacognitive proofreading mechanics to manage writing anxiety. In terms of cognitive strategies, using prior knowledge and personal experiences scored the highest, whereas engaging in structured brainstorming to generate text concepts scored the lowest. These findings match the claims made by Owunna et al. (2025), where when students adapt to new ways of writing (such as co-writing with ChatGPT), they do not start from scratch. Instead, they rely heavily on their past knowledge and personal experiences.

Behaviourally, effort regulation patterns showed that students possessed high resilience, scoring highest on their determination not to give up when tasks became difficult. However, writing frequently to acquire skills on their own scored the lowest. This behavioural trend is in accordance with the study by Khairuddin et al. (2025), which observed that Malaysian university students show strong perseverance when executing assigned writing tasks but lack consistent, routine independent practice. Socially, peer collaboration was highest when students encountered trouble writing, but lowest for seeking peer feedback after completing a thorough self-revision. This result is in accordance with the study by Khairuddin et al. (2021), which noted that social strategies are primarily treated as short-term troubleshooting interventions rather than proactive peer-review habits. Finally, within the affective domain, self-encouragement despite a fear of making errors scored the highest. This finding is in accordance with the study by Khairuddin et al. (2021), which verified that language anxieties present a persistent barrier to independent writing confidence even when digital scaffolds are available. Meanwhile, writing with confidence and ease in class scored the lowest. This aligns with the warnings of Yang et al. (2026) regarding the critical need to build active academic self-confidence in language classrooms.

The final research question examined the relationship between all factors in writing, revealing that all three factors share a significant, positive correlation. The data indicated a strong positive association between personal and behavioural factors, a moderate positive association between environmental and personal factors, and a weak positive association linking behavioural and environmental factors. Therefore, the fourth null hypothesis is rejected. This is in accordance with the foundational theory by Bandura (2012), proving that an AI-mediated writing environment, internal student perceptions, and active behavioural strategies function through triadic reciprocal determinism, continually shaping and reinforcing one another.

Implications and Suggestions for Future Research

Theoretical and Conceptual Implications

The results of this study support Albert Bandura's Social Cognitive Theory in the context of digital education. The findings show a clear, positive three-way relationship, which means ChatGPT should not be viewed as just an external tool. For example, there is a moderate connection between environmental and personal factors ($r = .313^{**}$) and a strong connection between personal and behavioural factors ($r = .567^{**}$). This suggests that the AI environment changes how students think, which then shapes their actions. Furthermore, the differences found in personal factors across academic disciplines and language skills show that personal factors in SCT depend heavily on context. This calls for more complex theoretical models instead of a single, universal approach.

Pedagogical Implications

The findings of this study lead to several pedagogical implications for educators and curriculum designers. Firstly, educators should focus less on surface-level corrections and more on helping students use ChatGPT for

high-level cognitive tasks, for instance, outlining, creating a thesis, and mapping out ideas before they start drafting. This is because many students use digital tools mainly to fix their spelling and grammar, instead of organising their ideas before writing.

Next, educators should actively create focused micro-writing assignments since students show great task resilience in completing their assignments but maintain a low routine writing frequency on their own. Teachers can create short, focused writing tasks using AI, and include these exercises in weekly lessons. This approach can normalise the writing process and encourage students to practise continuously and consistently.

In addition, curriculum designers should consider starting to treat prompt-engineering as a formal academic skill. The findings of this study show that students already use other sources to check the accuracy of AI outputs, so curriculum designers should include structured training on prompt engineering and careful source verification in the curriculum. This approach turns a tool that is often seen as a casual resource into a valuable academic resource that supports and upholds academic integrity.

Suggestions for Future Research

There are several recommendations for future research. First, future research should focus on longitudinal studies that follow ESL student groups across several semesters. Using a longer timeline is important for understanding how regular use of generative AI affects students' thinking and behaviour in the long run. This approach can help researchers see if ongoing use of ChatGPT leads to a slow decline in students' independent editing and proofreading skills, or if it acts as a steady support that helps students permanently build confidence in their writing. Furthermore, it is recommended that future research employ qualitative and mixed methods to provide a deeper context. The current quantitative survey shows clear group differences in personal factors by gender and academic discipline, but numbers alone do not reveal the reasons behind these patterns. Using qualitative tools like semi-structured interviews, diary studies, or open-ended focus groups can help researchers find the root causes, personal backgrounds, and academic concerns that shape these differences. Finally, future studies should use more varied sampling to improve how well the results apply to other groups. This study is limited because it only used convenience sampling at one Malaysian public university. Including participants from different types of institutions, locations, and cultural backgrounds would strengthen the theoretical framework and offer a more comprehensive understanding of AI-mediated writing strategies in higher education.

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