

Leveraging ChatGPT to Reduce Cognitive Load in Second Language Writing

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ABSTRACT

Writing is a cognitively demanding process that requires learners to generate ideas, organise content, apply language knowledge and revise their work. The emergence of ChatGPT has provided learners with additional support that may help reduce cognitive load during writing. Therefore, this quantitative survey explored learners' perceptions of using ChatGPT to reduce cognitive load in writing and examined its relationship with writing strategies. A total of 171 university students participated in a survey consisting of two sections on writing strategies and ChatGPT. The findings revealed positive perceptions towards ChatGPT and writing strategies, with significant positive relationships found between ChatGPT and all writing strategy dimensions. The study suggests that ChatGPT can serve as a supportive tool that complements learners' writing strategies and facilitates the writing process.

Keywords: academic writing, ChatGPT, cognitive load, writing strategies, writing process

INTRODUCTION

Background of Study

Writing is often regarded as one of the most cognitively demanding language skills because it requires writers to generate ideas, organise content, apply grammatical rules and simultaneously monitor vocabulary and sentence structure. It involves multiple stages, particularly in academic writing, where the learners are expected to follow specific instructions and fulfil the scope and requirements of a task. As a result, writing may lead to cognitive load among learners as they are likely to feel overwhelmed throughout the writing process while trying to produce quality writing. According to Gkintoni et al. (2025), it is important to avoid overload because learning is complex and it can negatively affect learners' knowledge retention and transfer. Similar findings, Khan et al. (2026) highlighted that when learners are pressured to write, it leads to frustration and affects their self-confidence. In response to this challenge, the emergence of AI tools such as ChatGPT has created tremendous opportunities for learners to learn and develop their writing skills. Khan et al. (2026) further noted that the usage of AI tools in education has transformed the conventional approach when completing writing tasks, covering many features from offering feedback when generating ideas to suggesting improvements as it is widely accessible to learners. Through these features, they can reduce their cognitive effort as the interaction with AI tools allows them to have real-time feedback and make necessary changes upon the submission of the task (Feng, 2024). Yet, the challenges in utilising AI tools must be acknowledged because learners should still hold the autonomy to dictate their writing and not depend on the feedback and suggestions provided by the tools. Therefore, as suggested by Khan et al. (2026), rather than prohibiting the learners from using AI tools to complete their academic tasks, greater emphasis should be placed on how those tools should be used responsibly and ethically. As one of the most widely used generative AI tools, ChatGPT has significantly influenced the future

of writing, creating opportunities to enhance learning while simultaneously presenting new challenges in the educational setting. Therefore, understanding how ChatGPT can assist learners in managing cognitive demands during writing has become increasingly important.

Statement of Problem

Recent studies have demonstrated ChatGPT as an influential support mechanism in language learning and academic writing particularly in ESL and EFL classrooms. It has been reported that ChatGPT assists learners in various stages of the writing process i.e. idea development, improving content and enhancing language use. For instance, Ibrahim (2024) reported that ChatGPT can strengthen L2 learners by enhancing their motivation, delivering automated support and providing instant personalized feedback. In the same vein, Woo et al. (2024) also ChatGPT contributed positively in promoting learners' engagement in EFL writing classroom. However, it is also addressed that learners may experience high cognitive demands specifically when constructing effective prompts when utilizing ChatGPT. These findings imply that ChatGPT is not just a text-generation tool, its role remains complex as a tool that influences learners' plan, draft and evaluate their writing. However, despite its potential benefits, ChatGPT-assisted writing presents several challenges. While it may support learners' grammar, vocabulary and idea generation, it may also create another layer of cognitive dissonance for learners. According Yao and Fan (2025), when engaging with ChatGPT, learners must first generate effective prompts, evaluate the generated text, synthesize the output while also maintaining authorial control. For struggling learners on the other hand, ChatGPT raised concerns in terms of over-reliance on the tools which may weaken one's ability to generate authentic ideas and manage independent writing (Akanda & Talukder, 2026). This suggests that without strategic control, learners might become overdependent to the tools.

Recent research also highlights the need to explore the use of ChatGPT across different learners' context and writing demands to have a more comprehensive understanding. Li et al. (2024) addressed the need for an expanded research scope considering the stakeholders perspectives, longitudinal results and quality of the generated feedback. Similarly, Yao and Fan (2025) recommended that AI-assisted L2 writing be examined across learners with different background, proficiency levels, educational levels and the demand of the writing tasks. These recommendations represent a base for further research focusing on how learners experience writing with ChatGPT particularly in relation to cognitive load. Therefore, this study aims to explore learners' perceptions of using ChatGPT specifically focusing on the metacognitive, effort regulation, cognitive and social-affective writing strategies adapted from Raoofi et al. (2017) while also considering critical thinking, academic achievement and social-affective strategies adapted from Youssef et al. (2024). Furthermore, the study also investigates whether genders, level of study and discipline play a role in one's writing strategies and ChatGPT usage. It is hoped that the findings could shed light on how ChatGPT can function as a meaningful tool while maintaining autonomy and authenticity.

Objective of the Study and Research Questions

This study is done to explore writing using ChatGPT. Specifically, this study is done to answer the following questions;

- Is there a significant relationship for (a) writing and (b) ChatGPT across gender?

H₀₁: There is no significant relationship for (a) writing and (b) ChatGPT across gender

- Is there a significant relationship for (a) writing and (b) ChatGPT across levels?

H₀₂: There is no significant relationship for (a) writing and (b) ChatGPT across levels

- Is there a significant relationship for (a) writing and (b) ChatGPT across disciplines?

H₀₃: There is no significant relationship for (a) writing and (b) ChatGPT across discipline

- How do learners perceive the use of ChatGPT to reduce cognitive load in writing?

- How do learners perceive using metacognitive writing strategies?
- How do learners perceive using effort regulation as a writing strategy?
- How do learners perceive using cognitive writing strategies?
- How do learners perceive using social-affective writing strategies?
- Is there a significant relationship between ChatGPT and the use of writing strategies?

H₀₄: There is no significant relationship between ChatGPT and the use of writing strategies

LITERATURE REVIEW

Theoretical Framework of the Study

Cognitive Load Theory

This study is grounded in Cognitive Load Theory (CLT), developed by Sweller (1988), which explains that learning is influenced by the limited capacity of working memory during information processing. According to the theory, cognitive overload occurs when learners are required to process information beyond their available cognitive resources. Cognitive Load Theory identifies three forms of cognitive load, namely intrinsic load, extraneous load, and germane load (Paas et al., 2004). Intrinsic load refers to the complexity of a learning task, extraneous load refers to unnecessary cognitive effort caused by poor instructional design, while germane load refers to the mental effort devoted to knowledge construction and learning. The theory suggests that effective learning occurs when instructional support reduces unnecessary cognitive burden and enables learners to focus on meaningful learning activities.

The application of Cognitive Load Theory has become increasingly relevant in technology-enhanced learning environments, particularly with the integration of artificial intelligence tools such as ChatGPT. Within the context of writing, learners are required to generate ideas, organise content, monitor language accuracy, evaluate information, and revise their work simultaneously, making writing a cognitively demanding task. Woo et al. (2024) reported that ChatGPT-assisted writing involves an iterative process in which learners construct prompts, evaluate generated responses, and revise their writing accordingly. While learners may experience additional cognitive demands during prompt engineering, ChatGPT also provides support through idea generation, language assistance, feedback, and content development. Similarly, Avello-Martínez et al. (2024) found that the use of ChatGPT reduced learners' cognitive load by decreasing the mental effort required to complete learning tasks, suggesting that ChatGPT can function as a cognitive support tool that facilitates learning and writing processes.

In this study, Cognitive Load Theory provides a suitable framework for examining how learners manage the cognitive demands associated with academic writing through the use of writing strategies and technological support. According to Raoofi et al. (2017), learners employ metacognitive, effort regulation, cognitive, social, and affective strategies to regulate and monitor their writing processes. At the same time, ChatGPT may support learners through critical thinking development, academic achievement, student engagement, and writing assistance, as proposed by Youssef et al. (2024). Since both writing strategies and ChatGPT function as mechanisms that may reduce cognitive burden and facilitate learning, Cognitive Load Theory provides an appropriate theoretical lens for examining learners' perceptions of effective writing strategies, learners' perceptions of ChatGPT, and the relationship between these constructs in the context of academic writing.

Writing and ChatGPT

ChatGPT has become a significant role in writing as an assistant, collaborative learning tool and providing feedback. Based on a systematic review by Imran and Almusharraf (2023), ChatGPT is capable of supporting learners and even researchers to generate ideas, produce drafts, summarise literature and improve the language

aspects in writing tasks. It is established that ChatGPT is now known as an effective writing assistant which enhances productivity and writing efficiency. With similar findings, Alkamel and Alwagieh (2024) summarised that learners have shown positive perceptions towards the use of ChatGPT as an AI-based tool in academic writing. It is further indicated that ChatGPT has helped learners to improve their writing skills. The learners are able to improve their content, and simultaneously refine their language. Tseng and Lin (2024) also highlighted that ChatGPT represents a new era of borderless learning because it eases learners in understanding the instruction better and eventually produces better quality writing. With proper instruction and guidance, the study suggested that the inclusion of ChatGPT fosters a more engaging and interactive learning environment since learners can revise and make changes throughout the writing process until they are satisfied. However, the challenges associated with ChatGPT must be acknowledged, including concerns about academic integrity and plagiarism. As mentioned in a study by Athaluri et al. (2023), the issue of AI hallucination occurs when references cited by ChatGPT are inconsistent and unreliable. Alkamel and Alwagieh (2024) found out that the learners are aware of the challenge and question the reliability of the information provided by ChatGPT. Therefore, the learners would have to conduct critical evaluation and fact-checking to ensure the authentication of information. Supported by Imran and Almusharraf (2023), ChatGPT still lacks the ability to consistently provide consistent authentic and relevant citation. There is also a possibility that AI generated information is plagiarised through excessive reliance of the existing sources with minimal paraphrasing. With the uncertainty of AI-based tools in academic writing, it has created a new level of risks including copyrights, authorship and attribution, particularly due to the lack of clear regulations and ethical guidelines for students regarding AI-generated content. Overall, the findings indicate that ChatGPT has strong potential to transform writing practices by assisting learners in idea generation, revision, and language improvement, although ethical concerns and overdependence on AI remain important considerations in academic writing.

Past Studies

Past Studies on Writing and ChatGPT

The emergence and integration of AI tools, specifically ChatGPT in writing has fundamentally redefined the conventional approach of the teaching and learning of writing. While many scholars have recognized its capacity to facilitate writing in terms of brainstorming (Fitria, 2023), language development and writing fluency (Levine et al, 2025), it is argued that noticeable excessive reliance on the tools have raised critical concerns. This reliance has resulted in the students' inability to develop ideas critically, due to an increased dependence on AI-generated assistance. Consequently, the integration of AI in higher education is constantly contested with questions if the pedagogical benefits could outweigh its ethical use.

Multiple studies have outlined the capabilities of ChatGPT in generating high standards of academic writing. Herbold et al. (2023) revealed that essays produced by ChatGPT argumentative essays were evaluated higher than human-written essays in terms of coherence and linguistic complexity. Similarly, Fitria (2023) reported that ChatGPT is able to produce sophisticated essay organisations in terms of introductions, supporting details and coherent conclusions. While these studies have different research focus, Herbold et al. (2023) examined comparative outcomes while Fitria (2023) emphasized on textual structure, both studies have remarked the promising potential of ChatGPT in enhancing written production. It is important to also note that both studies have raised concerns regarding the authenticity of the product while noting its ability to diminish the human's cognitive role.

Recent studies have also explored how ChatGPT is a favoured tool during different phases of writing. Levine et al. (2025) reported in their study that the respondents used ChatGPT during the brainstorming stage (planning, drafting and revising) reflecting the integration of ChatGPT as a tool instead of producing AI generated essays. This is parallel to another study which highlighted its usefulness for proofreading, translation and content development (Imran & Almusharraf, 2023). Lingard (2023) on the other hand highlighted the use of effective prompting techniques in generating and organizing specific ideas. These findings have demonstrated that ChatGPT operates beyond the text-generation tool but serves as a collaborative writing assistant that enhances the writing process and outcomes. Nevertheless, the increasing dependence of AI-assisted support is also addressed in these studies as it may limit user's ability in developing authentic writing independently.

Despite its significant potential in supporting and improving academic writing, its increasing use remains controversial especially in academic context. It has been underlined that the use of ChatGPT has raised concerns regarding plagiarism, originality and academic honesty (Imran & Almusharraf, 2023), users' over-dependence and overly reliant on AI-generated answers (Levine et al. 2023), the production of inaccurate and misleading information which may consequently compromise the credibility of the writers (Lingard, 2023). While many studies have investigated the use of ChatGPT as a writing assistant, limited research has focused on how ChatGPT reduces that cognitive load among ESL learners during writing tasks. Therefore, additional research is necessary to determine how ChatGPT influences learners' in managing cognitive demands without compromising originality and authenticity. It is also needed to examine if there is any significant relationship between ChatGPT and writing approaches adopted by learners.

Conceptual Framework of the Study

The conceptual framework of the study is presented in Figure 1 below. This study investigates how ChatGPT is used to reduce cognitive load in writing. Academic writing is a complex process. Writers need to go through many stages to complete the writing task. One way to reduce the complexity is by using strategies (Khairuddin, et. al 2021). Among some difficult strategies in writing are cognitive and metacognitive strategies (Rahmat, 2020). The use of other strategies helps overcome the difficulties.

Raoofi et al. (2017) state that writing strategies include metacognitive, effort regulation, cognitive, social, and affective writing strategies. Today, many writers 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 thus investigates the relationship between ChatGPT and writing strategies.

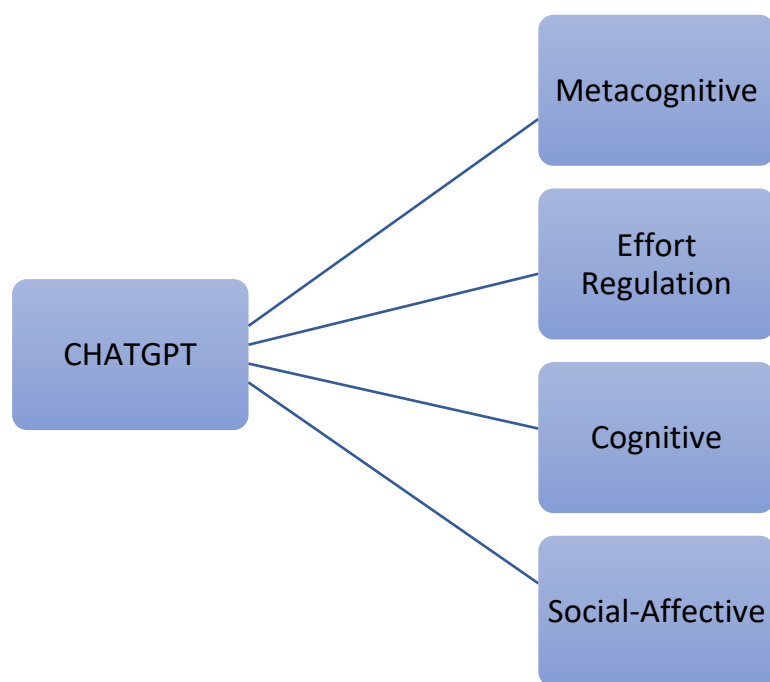


Figure 1- Conceptual Framework of the Study

Reducing Cognitive Load in Writing using ChatGPT

METHODOLOGY

This quantitative study is done to explore writing using ChatGPT. A convenient sample of 171 participants responded to the survey. The instrument used is a 5 Likert-scale survey and is rooted from Raoofi,et.al (2017) & 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- Likert Scale Use

1	Never
2	rarely
3	Sometimes
4	Often
5	Always

Table 2- Distribution of Items in the Survey

SECTION	VARIABLE	CONSTRUCT	NO OF ITEMS	Cronbach Alpha
B	WRITING STRATEGY Raoofi, et.al (2017)	Metacognitive	10	.860
		Effort Regulation	4	.794
		Cognitive	6	.770
		Social	4	7 (.780)
		Affective	3	
C	CHAT GPT Youssef,et.al.(2024)	Critical thinking abilities	4	16 (.918)
		Academic achievement	4	
		ChatGPT usage	5	
		Student engagement	3	
				43 (.937)

Table 2 shows the distribution of items in the survey. Section B has 17 items on writing strategy. Section C has 16 item son ChatGPT.

Table 3- 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

In order to determine the internal reliability of the instrument, reliability analysis is conducted. Table 3 above shows the distribution and interpretation of Cronbach Alpha range. According to Ahmad et al. (2024), Cronbach Alpha scores between 0.7 to 0.9 is considered acceptable to excellent.

Table 2 also shows the reliability of the survey. The analysis shows a Cronbach alpha of .860 for Metacognitive, .794 for Effort regulation, .770 for Cognitive, and .780 for social-affective. The overall Cronbach alpha for all 43 items is .937; thus, revealing a good reliability of the instrument chosen/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), researches report demographic data in percentages to establish sample representatives, and allow for generalizability 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 4- Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	38%
		Female	62%
2	Level	Diploma	14%
		Bachelor	86%
3	Discipline	Science & Technology	56%
		Social Sciences , Humanities & Business	44%

Inferential Statistics

According to Shah (2024), there are three main functions of a T-test. Firstly, T-tests are done to compare means. This is used to determine whether the average scores (mean) or values of two groups, or one group against a known value, differ enough to be considered statistically meaningful and not and are not just due to random chance. Secondly, 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 draw conclusions about the populations from which their samples were drawn.

Findings for gender

This section presents data to answer research question 1: Is there a significant relationship for (a) writing and (b) ChatGPT across gender?

H₀₁: There is no significant relationship for (a) writing and (b) ChatGPT across gender

Table 5: T-Test for (a) writing and (b) ChatGPT across gender

Group Statistics					
	Q1GENDER	N	Mean	Std. Deviation	Std. Error Mean
WRITING	MALE	65	3.7595	.47782	.05927
	FEMALE	106	3.8616	.46533	.04520
CHATGPT	MALE	65	3.6250	.60687	.07527
	FEMALE	106	3.7046	.54619	.05305

Independent Samples Test										
Levene's Test for Equality of Variances					t-test for Equality of Means					
		F	Sig.	t	df	Significance One-Sided p Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
WRITING	Equal variances assumed	.311	.578	-1.379	169	.085 .170	-.10209	.07406	-.24829	.04411
	Equal variances not assumed			-1.370	132.725	.087 .173	-.10209	.07453	-.24952	.04534
CHATGPT	Equal variances assumed	1.769	.185	-.887	169	.188 .377	-.07960	.08979	-.25685	.09765
	Equal variances not assumed			-.864	124.629	.195 .389	-.07960	.09209	-.26186	.10266

A two-sample t-test was performed for (a) writing and (b) ChatGPT across gender. There was no significant difference in (a) writing ($p=.170$) and (b) ChatGPT ($.377$) across gender. Null hypothesis is accepted for H_{01} .

Findings for levels

This section presents data to answer research question 2: Is there a significant relationship for (a) writing and (b) ChatGPT across levels?

H_{02} : There is no significant relationship for (a) writing and (b) ChatGPT across levels

Table 6: T-Test for (a) writing and (b) ChatGPT across levels

Group Statistics					
	Q2LEVEL	N	Mean	Std. Deviation	Std. Error Mean
WRITING	DIPLOMA	24	3.7160	.42449	.08665
	Degree	147	3.8403	.47762	.03939
CHATGPT	DIPLOMA	24	3.1667	.74924	.15294
	Degree	147	3.7572	.48992	.04041

Independent Samples Test										
Levene's Test for Equality of Variances					t-test for Equality of Means					
		F	Sig.	t	df	Significance One-Sided p Two-Sided p	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
WRITING	Equal variances assumed	.022	.883	-1.199	169	.116 .232	-.12421	.10364	-.32880	.08038
	Equal variances not assumed			-1.305	33.266	.100 .201	-.12421	.09518	-.31781	.06938
CHATGPT	Equal variances assumed	4.820	.029	-5.036	169	<.001 <.001	-.59056	.11727	-.82207	-.35905
	Equal variances not assumed			-3.733	26.303	<.001 <.001	-.59056	.15819	-.91554	-.26559

A two-sample t-test was performed for (a) writing and (b) ChatGPT across levels. There was no significant

difference in (a) writing ($p=.232$) but there is a significant difference for (b) ChatGPT ($<.001$) levels. Null hypothesis is rejected for (a) but rejected for (b) for H_{02} .

Findings for disciplines

This section presents data to answer research question 3: Is there a significant relationship for (a) writing and (b) ChatGPT across disciplines?

H_{03} : There is no significant relationship for (a) writing and (b) ChatGPT across discipline

Table 7: T-Test for (a) writing and (b) ChatGPT across disciplines

Group Statistics					
Q3DISCIPLIE	N	Mean	Std. Deviation	Std. Error Mean	
WRITING S&T	95	3.7540	.41313	.04239	
SS,H,B	76	3.9089	.52551	.06028	
CHATGPT S&T	95	3.7632	.46422	.04763	
SS,H,B	76	3.5633	.66540	.07633	

Independent Samples Test										
Levene's Test for Equality of Variances				t-test for Equality of Means						
		F	Sig.	t	df	Significance		Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference
						One-Sided p	Two-Sided p			
WRITING	Equal variances assumed	4.685	.032	-2.158	169	.016	.032	-.15487	.07177	-.29656 -.01319
	Equal variances not assumed			-2.102	140.161	.019	.037	-.15487	.07369	-.30056 -.00919
CHATGPT	Equal variances assumed	3.283	.072	2.309	169	.011	.022	.19984	.08656	.02896 .37071
	Equal variances not assumed			2.221	129.154	.014	.028	.19984	.08997	.02183 .37784

A two-sample t-test was performed for (a) writing and (b) ChatGPT across disciplines. There were significant differences in (a) writing ($p=.032$) and (b) ChatGPT (.022) across disciplines. Null hypothesis is rejected for H_{03} .

Descriptive Statistics

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 whole a high. SD indicates they are more spread out. It is good to have a high SD.

Findings for ChatGPT

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

Table 8- Mean (M) and Standard Deviation (SD) 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.	3.8	0.89

CTQ2 ChatGPT's responses made me doubt their validity, leading me to seek further clarification or evidence.	3.84	0.79
CTQ3 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.	3.86	0.78
CTQ4I need clarification about the accuracy of ChatGPT's output, which often encourages me to evaluate the information and conduct additional research independently.	4.15	0.74

Table 8 shows the mean score for respondents' perceptions of critical thinking abilities when using ChatGPT. Overall, the mean scores ranged from 4.15 to 3.80, indicating relatively high levels of critical thinking abilities among the respondents. Q4 achieved the highest mean score of 4.15, indicating that respondents generally agreed that there is a need to clarify the accuracy of ChatGPT's output which encouraged them to evaluate the information and conduct additional research. This was followed by Q3, with the second highest mean score of 3.86 suggesting that the respondents explored alternative viewpoints and additional resources of information to gain more comprehensive understanding on the topic discussed on ChatGPT. Next, Q2 obtained a mean score of 3.84, showing that respondents tended to question the validity of ChatGPT's responses and seek further clarification or evidence. Lastly, Q1 recorded the lowest mean score of 3.8, confirming that respondents seek for precision and reliability of information provided by ChatGPT. In general, the findings suggested that the respondents evaluate information critically, verify evidence and explore other alternatives before accepting the information provided by ChatGPT.

Table 9 - Mean (M) and Standard Deviation (SD) for ACADEMIC ACHIEVEMENTS (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.	3.80	0.73
AAQ2 ChatGPT brings innovative ideas that are ready to be shared with students.	3.79	0.81
AAQ3 Students can anticipate robust writing guidance from ChatGPT.	3.71	0.82
AAQ4 ChatGPT has improved my academic performance.	3.85	0.86

Table 9 shows the mean scores for respondents' perception of academic achievements when using ChatGPT. Collectively, the mean scores ranged from 3.85 to 3.71, indicating a relatively positive perception of the impact of ChatGPT on academic achievements among the respondents. Q4 recorded the highest mean score of 3.85, suggesting that respondents agreed that ChatGPT has improved their academic performance. This is closely followed by Q1 with a mean score of 3.80, proving that respondents explored alternative viewpoints and sources of information to achieve a more comprehensive understanding of a topic. Q2 obtained a mean score of 3.79, showing that respondents perceived ChatGPT as a platform that generated innovative ideas suitable for them. In contrast, Q3 recorded the lowest mean score of 3.71, indicating that respondents moderately agreed that ChatGPT provides robust writing guidance for them. Taken together, the findings demonstrated that respondents acknowledged ChatGPT as a useful tool to enhance their academic performance, support idea generation and assist the learning process.

Table 10- Mean (M) and Standard Deviation (SD) for CHATGPT USAGE (CU)

ITEM	M	SD
CUQ1 ChatGPT is a state-of-the-art writing model that is favorably used today.	4.02	0.76
CUQ2 Students seek help from ChatGPT's assistance in composing essays and articles.	3.58	0.88
CUQ3 ChatGPT helps students in English language translation.	3.35	1.07

CUQ4 Employing ChatGPT significantly improves human productivity.	3.34	0.95
CUQ5 The advent of ChatGPT marks a groundbreaking transformation in Natural Language Processing capabilities.	3.42	0.94

Table 10 reports the mean scores and standard deviations for respondents' perceptions of ChatGPT usage. Overall, the perceptions are generally positive ranging from 3.34 to 4.02. The highest item rated was CUQ1, *'ChatGPT is a state-of-the-art writing model that is favorably used today'* (M = 4.02, SD = 0.76) which implies that respondents strongly perceived ChatGPT as a relevant tool for writing. This is followed by CUQ2 (M = 3.58, SD = 0.88) which suggests that the respondents are aware of students' tendency to use assistance for ChatGPT when composing essays and articles. Lower mean score (M = 3.35) for CUQ3, and (M=3.34) and CUQ4 which revealed that respondents are not fully using ChatGPT for translation purposes and are not fully convinced that it could enhance human productivity. The highest variation in responses is noted in CUQ3, further indicating that respondents have mixed views about using ChatGPT for translation-related tasks. In general, the findings revealed that the respondents positively acknowledged its usefulness and relevance although they are uncertain about its role in translation and productivity.

Table 11- Mean (M) and Standard Deviation (SD) for Student Engagement (Se)

ITEM	M	SD
SEQ1 ChatGPT is more interactive, human-like, and engaging for the students.	3.23	0.86
SEQ2 ChatGPT increases confidence in my ability to conduct research/to search for materials	3.43	0.84
SEQ3 ChatGPT is easy to use and more engaging for me	3.67	0.82

Table 11 denotes the mean scores and standard deviations for respondents' perceptions of Student Engagement (SE) when using ChatGPT. The mean scores are generally moderate ranging from 3.23 to 3.67, revealing moderate positive perceptions of ChatGPT in supporting students' engagement. The highest mean is recorded for SEQ3 (M = 3.67, SD = 0.82) revealing that they found ChatGPT to be user-friendly and engaging. This suggests that being easily accessible may also contribute to learner's willingness to engage with ChatGPT. SEQ2 also recorded moderate ratings (M = 3.43, SD = 0.82) providing evidence that learned moderately agreed that ChatGPT can support confidence when searching for research materials. The lowest mean (M = 3.23) is recorded for SEQ1 suggesting that respondents are not entirely convinced that ChatGPT provides human-like and engaging for students. The range of standard deviation is relatively low (0.82 to 0.86) indicating that the respondents' views were fairly consistent. Generally, the findings suggest that ChatGPT could support students' engagement due to it being user-friendly and its ability to support research while its ability to connect as human-like interaction remains limited.

Findings for Metacognitive Writing Strategies

This section presents data to answer research question 2: How do learners perceive using metacognitive writing strategies?

Table 12- Mean (M) and Standard Deviation (SD) for MTEACOGNITIVE (MWS)

ITEM	M	SD
MWSQ 1 I organize my ideas prior to writing.	3.80	0.78
MWSQ 2 I revise my writing to make sure that it includes everything I want to discuss in my writing.	4.11	0.72
MWSQ 3 I check my spelling.	4.16	0.77
MWSQ 4 I check my writing to make sure it is grammatically correct.	4.11	0.73

MWSQ 5 I evaluate and re-evaluate the ideas in my essay.	3.95	0.71
MWSQ 6 I monitor and evaluate my progress in writing.	3.89	0.69
MWSQ 7 I revise and edit an essay two or more times before I hand it in to my teacher.	3.88	0.85
MWSQ8 I go through the planning stages in my writing.	3.92	0.74
MWSQ9 I go through the drafting stages in my writing.	3.93	0.68
MWSQ10 I go through the revising and editing stages in my writing.	3.19	0.82

Table 12 presents the mean scores for learners' perceptions of using metacognitive writing strategies. Overall, the findings indicate that learners had positive perceptions towards the use of metacognitive strategies in writing, as all items recorded mean scores above 3.00, ranging from 3.19 to 4.16. The highest mean score of 4.16 was obtained for Q3 showing that learners strongly emphasised checking spelling in their writing process. Similarly, Q2 and Q4 both recorded a 4.11 mean score, suggesting that learners valued revising and grammatical accuracy. In addition, learners moderately agreed that they evaluate and re-evaluate ideas in their essays (Q5, M=3.95), go through drafting stages (Q9, M=3.93) and planning stages in writing (Q8, M=3.92). Furthermore, item Q6 shows that learners monitor and evaluate their writing progress (M=3.89) while item Q7 suggests that students revise their essays multiple times before submitting their work with the average mean of 3.88. However, Q10 recorded the lowest mean score of 3.19 indicating that revising and editing may not be consistently practised by all learners. All in all, the findings suggest that learners generally perceived metacognitive writing strategies positively and frequently applied them during their writing process.

Findings for Effort Regulation Writing Strategies

This section presents data to answer research question 3: How do learners perceive using effort regulation as a writing strategy?

Table 13- Mean (M) and Standard Deviation (SD) for Effort Regulation (Ers)

ITEM	M	SD
ERSQ 1I write a lot to develop my writing skills.	3.79	0.81
ERSQ 2I often work hard to do well in my writing even if I don't like English writing tasks.	4.01	0.72
ERSQ 3Even if the writing activities are difficult, I don't give up but try to engage in them.	4.08	0.71
ERSQ 4I concentrate as hard as I can when doing a writing task.	3.69	0.84
ERSQ I spend a lot of time and energy on writing good English assignments.	3.57	0.81

Table 13 presents the mean score for learners' perceptions of using effort regulation as a writing strategy. It is shown that the mean scores ranged from 4.08 to 3.57, indicating that learners generally demonstrated positive effort regulation behaviours in writing tasks. Among the items, Q3 recorded the highest mean score of 4.08, suggesting respondents have a high tendency to persist and continue engaging in writing activities even when the tasks were difficult. Followed by Q2 with a mean score of 4.01, indicating that respondents often work hard to perform well in writing tasks despite not liking English writing activities. Q1 obtained a mean score of 3.79, showing that respondents write frequently to improve their writing, while Q4 recorded a mean score of 3.69, reaffirming that respondents also tried to concentrate as much as they could when completing writing tasks. Finally, Q5 with the lowest mean score of 3.57, indicating that respondents moderately agreed that they spend a lot of time and effort producing good English writing assignments. In general, the findings suggest that respondents demonstrated concentration and consistent effort in developing their English writing skills.

Findings for Cognitive Writing Strategies

This section presents data to answer research question 4: How do learners perceive using cognitive writing strategies?

Table 14- Mean (M) and Standard Deviation (SD) for COGNITIVE (CWS)

ITEM	M	SD
CWSQ1 I use memorized grammatical elements such as singular and plural forms, verb tenses, prefixes and suffixes, etc, in my writing	3.57	0.81
CWSQ 2I put newly memorized vocabulary in my sentences.	3.91	0.74
CWSQ 3In order to generate ideas for my writing, I usually engage myself in brainstorming.	3.81	0.84
CWSQ 4I use different words that have the same meaning.	4.08	0.69
CWSQ 5I use my experiences and knowledge in my writing.	3.88	0.75
CWSQ 6I try to use effective linking words to ensure clear and logical relationship between sentences or paragraphs	3.63	0.94

Table 14 presents the learners' cognitive writing strategies. Item Q4 revealed the highest mean score ($M = 4.08$, $SD = 0.69$), reflecting that respondents regularly use synonyms when writing. Meanwhile, lowest mean was obtained for Q1 ($M = 3.57$, $SD = 0.81$) suggesting lower reliance of grammatical memorization strategies. Additionally, Q6 scored highest standard deviation ($SD = 0.94$) highlighting inconsistency among respondents in terms of using linking words in ensuring coherence between ideas. Overall, the findings suggest that respondents generally relied more on vocabulary-related approaches than grammar-focused strategies during writing.

Findings for Social Writing Strategies

This section presents data to answer research question 5: How do learners perceive using social writing strategies?

Table 15- Mean (M) and Standard Deviation (SD) 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.	3.62	1.04
SWSQ 2After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.	3.61	0.94
SWSQ 3I try to identify friends or classmates whom I can ask for help in my writing.	3.70	0.97
SWSQ 4 When I have trouble writing my essay, I try to do it with my classmates or friends.	3.62	0.74

Table 15 presents the learners' perceptions of using social writing strategies. Overall, the findings indicate that the respondents moderately agreed on the use of social strategies in supporting their writing process, as all mean scores ranged from 3.61 to 3.70. Among the items, Q3 recorded the highest mean score of 3.70 which shows that learners were generally willing to identify friends or classmates whom they could ask for help in writing. This suggests that peer support plays an important role in helping learners improve their writing skills. Meanwhile, Q1 and Q4 both obtained a mean score of 3.62, indicating that learners tended to discuss writing topics with friends and collaborate with classmates when facing difficulties in writing essays. These findings imply that learners value collaborative learning and interaction during the writing process. In addition, Item Q2 showed the lowest mean score of 3.61 although the score still reflects a positive perception towards asking peers to read and

comment on their essays after revision and editing. The relatively moderate standard deviation values across all items suggest that learners' responses were fairly consistent. In conclusion, the findings demonstrate that learners perceive social writing strategies positively and consider peer interaction beneficial in generating ideas, solving writing problems and improving the quality of their essays.

Findings for Affective Writing Strategies

This section presents data to answer research question 6: How do learners perceive using effective writing strategies?

Table 16- Mean (M) and Standard Deviation (SD) for AFFECTIVE (AWS)

ITEM	M	SD
AWSQ1I try to write an essay in class with confidence and ease	3.81	0.74
AWSQ2I try to relax whenever I feel afraid of writing.	3.97	0.73
AWSQ3I encourage myself to write even when I am afraid of making mistakes	3.74	0.81

Table 16 presents the mean scores for effective writing strategies. Overall, the findings indicate that respondents demonstrated positive perceptions towards the use of effective strategies when writing. All three items recorded mean scores above 3.70, suggesting that respondents frequently employed emotional regulation strategies to support their writing process. Item AWSQ2 recorded the highest mean score ($M = 3.97$, $SD = 0.73$), indicating that respondents attempted to relax whenever they felt afraid of writing. This was followed by item AWSQ1 ($M = 3.81$, $SD = 0.74$), suggesting that respondents tried to write essays in class with confidence and ease. Item AWSQ3 recorded the lowest mean score ($M = 3.74$, $SD = 0.81$), although respondents still agreed that they encouraged themselves to write even when they were afraid of making mistakes. The relatively low standard deviations indicate consistency in respondents' responses. The findings reveal that learners actively employed affective strategies to manage anxiety, build confidence, and maintain motivation during the writing process.

Exploratory Statistics (correlation)

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), coefficient is significant at the .05 level and positive correlation is measured on a 0.1 to 1.0 scale. 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 Relationship between ChatGPT and the use of writing strategies

This section presents data to answer research question 7: Is there a significant relationship between ChatGPT and the use of writing strategies?

H_{04} : There is no significant relationship between ChatGPT and the use of writing strategies

To determine if there is a significant association in the mean scores between ChatGPT and the use of writing strategies, data is analysed using SPSS for correlations. Results are presented separately in Table 17 below.

Table 17- Correlation between ChatGPT and the use of writing strategies

		Metacognitive	Effort Regulation	Cognitive	Social Effective
ChatGP T	Pearson (Correlation	.328**	.294**	.326**	.421**

	Sig (2-tailed)	<.001	<.001	<.001	<.001
	N	171	171	171	171

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

Table 17 shows there is an association between ChatGPT and the use of writing strategies (metacognitive, effort regulation, cognitive and social-affective). Results show that there is a moderate, positive significant association for ChatGPT and metacognitive ($r=.328^{**}$) and ($p<.001$), cognitive ($r=.326^{**}$) and ($p<.001$), and social strategies ($r=.421^{**}$) and ($p<.001$). The correlation analysis also showed that there is a weak positive, and significant association for ChatGPT and effort regulation ($r=.294^{**}$) and ($p<.001$). Hence, the null hypothesis is rejected for H_{04} .

CONCLUSION

Summary of Findings and Discussion

This study investigated learners' perceptions of using ChatGPT to reduce cognitive load in writing and examined the relationship between ChatGPT and writing strategies. The findings revealed that there was no significant difference in writing strategies and ChatGPT perceptions across gender. This suggests that male and female learners shared similar perceptions regarding the use of writing strategies and ChatGPT when completing writing tasks. However, differences were found across educational levels for ChatGPT perceptions, while no differences were observed for writing strategies. Furthermore, significant differences were identified across disciplines for both writing strategies and ChatGPT perceptions. These findings support the recommendation by Li et al. (2024) and Yao and Fan (2025), who argued that ChatGPT-assisted writing should be examined across learners from different educational backgrounds and contexts. The findings indicate that learners' educational experiences and disciplinary demands may influence how ChatGPT is perceived and utilised during writing tasks.

In answering the research question on learners' perceptions of ChatGPT in reducing cognitive load during writing, the findings revealed generally positive perceptions across all four dimensions, namely critical thinking abilities, academic achievement, ChatGPT usage and student engagement. Among these dimensions, critical thinking abilities emerged as the strongest aspect, suggesting that learners actively evaluated the accuracy of ChatGPT-generated information, sought clarification and explored alternative viewpoints before accepting information provided by the tool. Student engagement, although positive, appeared to be the least dominant dimension. These findings support Ibrahim and Kirkpatrick (2024), who reported that ChatGPT enhances learners' motivation and provides personalised support throughout the writing process. The findings also align with Woo et al. (2024), who found that ChatGPT contributes positively to learner engagement in writing classrooms. Furthermore, the results are consistent with Youssef et al. (2024), who reported positive effects of ChatGPT on critical thinking, academic achievement and learning experiences. The present study therefore suggests that learners do not merely use ChatGPT as a source of answers but actively engage in evaluating and verifying information obtained through the platform.

The findings for metacognitive writing strategies showed that learners frequently employed planning, monitoring, checking and revising strategies during the writing process. Learners demonstrated strong attention towards spelling accuracy, grammatical correctness and content revision, indicating a conscious effort to regulate and evaluate their writing. However, revising and editing at later stages appeared less frequently practised compared to other metacognitive behaviours. These findings are consistent with Raoofi et al. (2017), who emphasised the importance of metacognitive strategies in helping learners plan, monitor and evaluate their writing performance. Similarly, Rahmat (2021) reported that cognitive and metacognitive strategies are important components of successful writing practices among ESL learners. The findings suggest that learners recognise the importance of self-monitoring and self-regulation in producing effective written work.

For effort regulation strategies, the findings revealed that learners generally demonstrated persistence and commitment towards completing writing tasks. Learners showed a willingness to continue writing even when tasks became difficult and reported working hard to perform well despite challenges. Spending substantial time

and energy on writing tasks, however, was the least dominant aspect of effort regulation. These findings indicate that learners possess positive motivational characteristics that enable them to sustain effort throughout the writing process. The findings support Khan et al. (2026), who highlighted that writing tasks often create pressure and frustration among learners. Despite these challenges, the respondents in this study demonstrated resilience and perseverance when completing writing activities, suggesting that effort regulation remains an important component of successful academic writing.

The findings for cognitive writing strategies revealed that learners relied heavily on vocabulary-related strategies and brainstorming activities during writing. The use of synonyms and personal knowledge appeared more prominent than the use of memorised grammatical rules. These findings indicate that learners preferred meaning-focused approaches rather than rule-based approaches when composing written texts.

The findings support Khairuddin et al. (2021), who argued that writing requires the use of multiple rhetorical and cognitive processes to organise ideas effectively. Likewise, Rahmat (2021) highlighted the importance of cognitive processing strategies in helping learners generate, organise and express ideas during writing tasks. The results suggest that learners actively draw upon existing knowledge and linguistic resources when composing academic writing.

The findings for social writing strategies showed that learners viewed peer support and collaboration positively throughout the writing process. Learners reported identifying friends who could assist them with writing, discussing writing topics with peers and collaborating when difficulties arose. Seeking peer feedback after revising essays, however, appeared slightly less common.

These findings support Levine et al. (2025), who reported that learners frequently use external support systems, including collaborative assistance, throughout various stages of writing. Similarly, Imran and Almusharraf (2023) suggested that writing support tools and collaborative learning opportunities can enhance writing development. The findings therefore indicate that social interaction remains an important aspect of writing despite the increasing availability of AI-supported learning tools.

The findings for affective writing strategies demonstrated that learners actively managed emotions associated with writing tasks. Learners reported attempting to relax when feeling anxious about writing and maintaining confidence throughout the writing process. Encouraging themselves despite fear of making mistakes was also commonly practised. These findings suggest that learners recognise the importance of emotional regulation in writing. This finding is consistent with Raoofi et al. (2017), who identified affective strategies as essential mechanisms that enable learners to manage anxiety and maintain confidence while writing. The results further indicate that successful writing involves not only cognitive processes but also emotional control and self-motivation.

Finally, the findings revealed a significant positive relationship between ChatGPT and all writing strategy dimensions. The strongest relationship was observed between ChatGPT and social-affective strategies, followed by metacognitive and cognitive strategies, while effort regulation demonstrated the weakest, although still significant, relationship. These findings indicate that learners who reported positive perceptions of ChatGPT also tended to employ writing strategies more frequently.

The findings support the argument presented by Imran and Almusharraf (2023) and Alkamel and Alwagieh (2024), who described ChatGPT as a writing assistant that facilitates idea generation, content development and writing improvement. Similarly, Woo et al. (2024) found that ChatGPT supports learners throughout the writing process by enhancing engagement and providing writing assistance.

The findings are also consistent with Cognitive Load Theory (Sweller, 1988), which proposes that instructional support can reduce cognitive burden and enable learners to allocate more cognitive resources towards meaningful learning activities. Therefore, the findings suggest that ChatGPT may function as a supportive tool that complements learners' writing strategies and assists them in managing the cognitive demands associated with academic writing.

Implications and Suggestions for Future Research

Theoretical and Conceptual Implications

This study contributes to the growing body of literature on the use of artificial intelligence in academic writing by extending the application of Cognitive Load Theory in AI-assisted learning environments. Cognitive Load Theory proposes that learners experience varying levels of cognitive burden when performing complex tasks and that appropriate instructional support can reduce unnecessary cognitive load while facilitating learning (Sweller, 1988; Paas et al., 2004). The findings of this study revealed that learners demonstrated positive perceptions towards both ChatGPT and writing strategies, suggesting that learners actively employed a combination of technological support and self-regulated writing strategies to manage the cognitive demands associated with writing. The positive perceptions of critical thinking, academic achievement, ChatGPT usage and student engagement further suggest that ChatGPT may function as a cognitive support mechanism that assists learners throughout the writing process.

The findings also provide support for the conceptual framework of the study, which proposed a relationship between ChatGPT and writing strategies in reducing cognitive load during writing. The significant positive relationships found between ChatGPT and all writing strategy dimensions indicate that learners who perceive ChatGPT positively also tend to employ metacognitive, effort regulation, cognitive and social-affective strategies more frequently. These findings suggest that ChatGPT does not replace writing strategies but rather complements and supports them. The strongest relationship observed between ChatGPT and social-affective strategies further highlights the importance of emotional regulation, confidence and social support in AI-assisted writing environments.

Furthermore, the findings contribute to existing discussions concerning the role of AI in academic writing. While previous studies have largely focused on writing outcomes, performance and productivity (Imran & Almusharraf, 2023; Alkamel & Alwagieh, 2024), the present study demonstrates that the relationship between ChatGPT and writing extends beyond writing products. The findings suggest that ChatGPT influences learners' thinking processes, engagement levels and strategic behaviours during writing. Therefore, this study expands current understanding of how AI tools can function within the framework of Cognitive Load Theory to support learning and writing development.

Pedagogical Implications

The findings of this study have several implications for language educators, curriculum designers and higher education institutions. Since learners demonstrated positive perceptions towards ChatGPT and reported using various writing strategies alongside the technology, educators should consider integrating ChatGPT as a guided instructional tool rather than viewing it solely as a threat to academic integrity. Instead of discouraging its use, educators may design writing activities that encourage learners to use ChatGPT responsibly for brainstorming, generating ideas, revising drafts and obtaining feedback while maintaining ownership of their written work.

The findings also indicate that learners actively evaluate information generated by ChatGPT, suggesting that critical evaluation skills should be incorporated into writing instruction. Educators should teach students how to assess the accuracy, credibility and reliability of AI-generated information before incorporating it into academic work. Activities such as comparing AI-generated responses with academic sources, evaluating evidence and verifying references may help learners develop stronger critical thinking skills while reducing overdependence on AI tools.

In addition, the positive findings related to metacognitive, effort regulation, cognitive and social-affective writing strategies suggest that writing instruction should continue to emphasise strategy-based learning. Teachers may explicitly teach planning, drafting, revising, monitoring and self-evaluation strategies while simultaneously demonstrating how ChatGPT can support each stage of the writing process. Collaborative writing activities, peer-review sessions and reflective writing exercises should also be encouraged as they strengthen social-affective strategies and help learners maintain autonomy during writing.

Since significant differences were found across educational levels and disciplines, educators should also recognise that learners may use ChatGPT differently depending on their academic backgrounds and writing requirements. Therefore, institutions should develop discipline-specific guidelines and training programmes that promote ethical and effective use of ChatGPT in academic writing. Such initiatives may help learners maximise the benefits of AI-assisted writing while preserving originality, authenticity and academic integrity.

Suggestions for Future Research

Several recommendations can be proposed for future studies. First, the present study employed a quantitative survey design which focused on learners' perceptions. Future researchers may adopt qualitative approaches such as interviews, focus group discussions or think-aloud protocols to gain deeper insights into how learners actually interact with ChatGPT throughout different stages of the writing process. Such approaches may reveal specific cognitive and behavioural strategies that cannot be captured through survey responses alone.

Second, future studies may investigate the long-term impact of ChatGPT on writing development. Since the present study examined learners' perceptions at a single point in time, longitudinal studies are needed to determine whether continued use of ChatGPT contributes to sustained improvements in writing skills, critical thinking abilities and academic performance. Longitudinal research may also help determine whether excessive reliance on ChatGPT influences learners' independence and writing autonomy over time.

Third, future researchers may explore additional learner variables such as language proficiency, digital literacy, frequency of ChatGPT usage and prior experience with AI-assisted learning. These factors may provide a more comprehensive understanding of how different learner characteristics influence the effectiveness of ChatGPT in supporting writing tasks.

Finally, future studies may investigate specific writing genres and academic contexts. The role of ChatGPT may differ across argumentative, expository, narrative and research-based writing tasks. Comparative studies involving learners from different institutions, disciplines and educational settings may provide broader insights into how ChatGPT influences writing strategies and cognitive load across diverse learning environments.

REFERENCES

1. Akanda, F., & Talukder, T. (2026). AI writing tools in English writing: Reviewing teachers' and students' views on benefits and concerns. *Social Sciences & Humanities Open*, (13), <https://doi.org/10.1016/j.ssaho.2026.102437>
2. Ahmad, N., Alias, F.A., Hamat, M., & Mohamed, S.A. (2024) Reliability Analysis: Application of Cronbach's Alpha in Research Instruments. *SIG: e-Learning@CS*, 114-119. <https://appspenang.uitm.edu.my/sigcs/>
3. Alkamel, M. A. A., & Alwagieh, N. A. S. (2024). Utilizing an adaptable artificial intelligence writing tool (ChatGPT) to enhance academic writing skills among Yemeni university EFL students. *Social Sciences & Humanities Open*, 10, 101095. <https://www.sciencedirect.com/science/article/pii/S2590291124002924>
4. Alam, M. N., Islam, M. A., Babiker, M. O., Siddiqui, M. S., Amin, M. B., & Oláh, J. (2026). AI-assisted learning tools and student learning outcomes: A cognitive load theory perspective. *Computers in Human Behavior Reports*, 21, 100986. <https://doi.org/10.1016/j.chbr.2026.100986>
5. Athaluri, S. A., Manthena, S. V., Kesapragada, V. K. M., Yarlagaadda, V., Dave, T., & Duddumpudi, R. T. S. (2023). Exploring the boundaries of reality: investigating the phenomenon of artificial intelligence hallucination in scientific writing through ChatGPT references. *Cureus*, 15(4). https://assets.cureus.com/uploads/original_article/pdf/148687/20230511-14808-1wokz88.pdf
6. Avello-Martínez, R., Gajderowicz, T., & Gómez-Rodríguez, V. G. (2024). Is ChatGPT helpful for graduate students in acquiring knowledge about digital storytelling and reducing their cognitive load? An experiment. *RED-Revista de Educación a Distancia*, 24(78).

7. Feng Teng, M. (2024). A systematic review of ChatGPT for English as a foreign language writing: Opportunities, challenges, and recommendations. *International Journal of TESOL Studies*, 6(3). <https://doi.org/10.58304/ijts.20240304>
8. Fitria, T. N. (2023). Artificial intelligence (AI) technology in OpenAI ChatGPT application: A review of ChatGPT in writing English essay. *ELT Forum: Journal of English Language Teaching*, 12(1), 44–57.
9. Gkintoni, E., Antonopoulou, H., Sortwell, A., & Halkiopoulou, C. (2025). Challenging cognitive load theory: The role of educational neuroscience and artificial intelligence in redefining learning efficacy. *Brain sciences*, 15(2), 203. <https://doi.org/10.3390/brainsci15020203>
10. He, L. (2024) The Application of SPSS Correlation Analysis in the Study if Precision Teaching of English in Universities. *Applied Mathematics and Nonlinear Science*, 9(1), 1-13. <http://dx.doi.org/10.2478/amns-2024-1371>
11. Herbold, S., Hautli-Janisz, A., Heuer, U., Kikteva, Z., & Trautsch, A. (2023). A large-scale comparison of human-written versus ChatGPT-generated essays. *Scientific Reports*, 13, 18617. <https://doi.org/10.1038/s41598-023-45644-9>
12. Ibrahim, K., & Kirkpatrick, R. (2024). Potentials and implications of ChatGPT for ESL writing instruction. *The International Review of Research in Open and Distributed Learning*, 25(3), 394–409. <https://doi.org/10.19173/irrodl.v25i3.7820>
13. Imran, M., & Almusharraf, N. (2023). Analyzing the role of ChatGPT as a writing assistant at higher education level: A systematic review of the literature. *Contemporary Educational Technology*, 15(4), ep464. <https://doi.org/10.30935/cedtech/13605>
14. Levine, S., Beck, S. W., Mah, C., Phalen, L., & Pittman, J. (2025). How do students use ChatGPT as a writing support? *Journal of Adolescent & Adult Literacy*, 68(5), 445–457. <https://doi.org/10.1002/jaal.1373>
15. Li, B., Lowell, V. L., Wang, C., & Li, X. (2024a). A systematic review of the first year of publications on CHATGPT and Language Education: Examining Research on CHATGPT's use in language learning and teaching. *Computers and Education: Artificial Intelligence*, 7, 100266. <https://doi.org/10.1016/j.caeai.2024.100266>
16. Lingard, L. (2023). Writing with ChatGPT: An illustration of its capacity, limitations & implications for academic writers. *Perspectives on Medical Education*, 12(1), 261–270. <https://doi.org/10.5334/pme.1072>
17. Khan, S., Gul, S., Mateen, H., & Ullah, H. (2026). From Assistance to dependence: The Impact of AI writing tools on ESL learner's academic writing skills. *Liberal Journal of Language & Literature Review*, 4(1), 1319-1335. <http://doi.org/10.5281/zenodo.19678293>
18. Khairuddin, Z., Rahmat, N.H., Noor, M.M., & Khairuddin, Z. (2021) The Use of Rhetorical Strategies in Argumentative Essays. *Pertanika Journal of Social Sciences & Humanities*, 29(S3), 263-285). <https://doi.org/10.47836/pjssh.29.S3.14>
19. Rahmat, N.H. (2021) An Investigative Study of Cognitive and Metacognitive Paraphrasing Strategies in ESL Writing. *International Journal of Academic Research in Business & Social Sciences*, 11(3), 76-87. <http://dx.doi.org/10.6007/IJARBS/v11-i3/8919>
20. Raoofi, S. Miri, A., Gharibi, J. & Malaki, B. (2017). Assessing and Validating a Writing Strategy Scale for Undergraduate Students. *Journal of Language Teaching and Research*, Vol 8(3), pp 624-633. Retrieved from <http://www.academypublication.com/issues2/jltr/vol08/03/23.pdf>
21. Shah, M. A. (2024). Meaning and Statistical Analysis of T-Tests in SPSS. *Journal of Saidu Medical College*, 14(1), 64-65. <https://doi.org/10.522006>
22. Tseng, Y. C., & Lin, Y. H. (2024). Enhancing English as a foreign language (EFL) learners' writing with ChatGPT: A university-level course design. *Electronic Journal of e-Learning*, 22(2), 78-97. <https://doi.org/10.34190/ejel.21.5.3329>
23. Vetter, T.R. (2017) Descriptive Statistics: Reporting the Answers to the 5 Basic Questions of Who, What, Why, When , Where, and a Sixth, so What? *Anesth Analg*, 125(5), 1797-1802. <https://doi.org/10.1213/ane.0000000000002471>
24. Youssef, E., Medhat, M., Abdellatif, S., & Al Malek, M. (2024) Examining the effect of ChatGPT usage on students' academic learning and achievement: A survey-based study in Ajman, UAE. *Computers and Education: Artificial Intelligence*, 7(Dec 2024), 100316. <https://doi.org/10.1016/j.caeai.2024.100316>

25. Woo, D. J., Wang, D., Guo, K., & Susanto, H. (2024). Teaching EFL students to write with ChatGPT: Students' motivation to learn, cognitive load, and satisfaction with the learning process. *Education and Information Technologies*, 29, 24963–24990.
26. Yao, G., & Fan, L. F. (2025). Cognitive load scale for AI-assisted L2 writing: Scale development and validation. *Frontiers in Psychology*.
27. Ziegenfuss, J. Y., Casey A. E., Jennifer M. D., Meghan M. J., Thomas E. K, and Marna, C.. (202) Impact of Demographic Survey Questions on Response Rate and Measurement: A Randomized Experiment. *Survey Practice* 14 (1), <https://doi.org/10.29115/SP-2021-0010>

APPENDIX

WRITING STRATEGIES & CHATGPT

(This instrument is adapted from Raoofi,et.al ,2017 & Youssef,et.al ,2024)

SECTION	VARIABLE	CONSTRUCT	NO OF ITEMS	
B	WRITING STRATEGY Raoofi, et.al (2017)	Metacognitive	10	10
		Effort Regulation	5	5
		Cognitive	6	6
		Social	4	7
		Affective	3	
C	CHAT GPT Youssef,et.al.(2024)	Critical thinking abilities	4	16
		Academic achievement	4	
		ChatGPT usage	5	
		Student engagement	3	
				44

Section B-Writing Strategies

Metacognitive (Mws)

ITEM	1	2	3	4	5
MWSQ 1 I organize my ideas prior to writing.					
MWSQ 2 I revise my writing to make sure that it includes everything I want to discuss in my writing.					
MWSQ 3 I check my spelling.					
MWSQ 4 I check my writing to make sure it is grammatically correct.					
MWSQ 5 I evaluate and re-evaluate the ideas in my essay.					
MWSQ 6 I monitor and evaluate my progress in writing.					
MWSQ 7 I revise and edit an essay two or more times before I hand it in to my teacher.					
MWSQ8 I go through the planning stages in my writing.					
MWSQ9 I go through the drafting stages in my writing.					
MWSQ10 I go through the revising and editing stages in my writing.					

Effort Regulation (Ers)

ITEM	1	2	3	4	5
ERSQ 1I write a lot to develop my writing skills.					
ERSQ 2I often work hard to do well in my writing even if I don't like English writing tasks.					



ERSQ 3 Even if the writing activities are difficult, I don't give up but try to engage in them.					
ERSQ 4 I concentrate as hard as I can when doing a writing task.					
ERSQ I spend a lot of time and energy on writing good English assignments.					

Cognitive (Cws)

ITEM	1	2	3	4	5
CWSQ1 I use memorized grammatical elements such as singular and plural forms, verb tenses, prefixes and suffixes, etc, in my writing					
CWSQ 2 I put newly memorized vocabulary in my sentences.					
CWSQ 3 In order to generate ideas for my writing, I usually engage myself in brainstorming.					
CWSQ 4 I use different words that have the same meaning.					
CWSQ 5 I use my experiences and knowledge in my writing.					
CWSQ 6 I try to use effective linking words to ensure clear and logical relationship between sentences or paragraphs					

PART 5-SOCIAL (SWS)

ITEM	1	2	3	4	5
SWSQ1 In order to generate ideas for my writing, I usually discuss the writing topic with a friend or classmate.					
SWSQ 2 After revising and editing my essay thoroughly, I ask a friend or my classmate to read and comment on it.					
SWSQ 3 I try to identify friends or classmates whom I can ask for help in my writing.					
SWSQ 4 When I have trouble writing my essay, I try to do it with my classmates or friends.					

PART 6-AFFECTIVE (AWS)

ITEM	1	2	3	4	5
AWSQ1 I try to write an essay in class with confidence and ease					
AWSQ2 I try to relax whenever I feel afraid of writing.					
AWSQ3 I encourage myself to write even when I am afraid of making mistakes					

Section B-ChatGPT

Critical Thinking Abilities (Ct)

ITEM	1	2	3	4	5
CTQ1 I usually need clarification on the precision and reliability of information provided by ChatGPT, which enhances my critical thinking skills.					
CTQ2 ChatGPT's responses made me doubt their validity, leading me to seek further clarification or evidence.					
CTQ3 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.					
CTQ4 I need clarification about the accuracy of ChatGPT's output, which often encourages me to evaluate the information and conduct additional research independently.					

**Academic Achievements (Aa)**

ITEM	1	2	3	4	5
AAQ1 I actively explore alternative viewpoints or sources of information when using ChatGPT to ensure a comprehensive understanding of the topic.					
AAQ2 ChatGPT brings innovative ideas that are ready to be shared with students.					
AAQ3 Students can anticipate robust writing guidance from ChatGPT.					
AAQ4 ChatGPT has improved my academic performance.					

ChatGPT Usage (Cu)

ITEM	1	2	3	4	5
CUQ1 ChatGPT is a state-of-the-art writing model that is favorably used today.					
CUQ2 Students seek help from ChatGPT's assistance in composing essays and articles.					
CUQ3 ChatGPT helps students in English language translation.					
CUQ4 Employing ChatGPT significantly improves human productivity.					
CUQ5 The advent of ChatGPT marks a groundbreaking transformation in Natural Language Processing capabilities.					

Student Engagement (Se)

ITEM	1	2	3	4	5
SEQ1 ChatGPT is more interactive, human-like, and engaging for the students.					
SEQ2 ChatGPT increases confidence in my ability to conduct research/to search for materials					
SEQ3 ChatGPT is easy to use and more engaging for me					