

Modeling the Relationship Between Cognitive Strategies, Effort Regulation, and Metacognitive Writing Strategies: The Mediating Role of Affective Factors

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ABSTRACT

Academic writing is a complex process demanding cognitive control as well as motivation, persistence and emotional control. While some research has focused on the strategies used for writing alone, fewer studies have considered the combination of cognitive, affective, and self-regulatory factors as a whole to support writing development. This study presents and tests a model exploring the relationships between cognitive strategies, effort regulation, affective strategies and metacognitive writing strategies of university students in Malaysia. A quantitative research design was adopted, which included 202 undergraduate and postgraduate students of academic writing in a public university. The Writing Strategy Scale was adapted from Raoofi et al. (2017) and used to gather data, which was then analysed using the Partial Least Squares Structural Equation Modelling (PLS-SEM) by SmartPLS 4. Significant positive relationships were found between effort regulation and affective strategies, effort regulation and metacognitive strategies, cognitive strategies and affective strategies, and cognitive strategies and metacognitive strategies. Affective strategies were also shown to mediate in the proposed model to a significant degree. The model accounted for 50.2% of the variance in the affective strategies and 53.4% of the variance in the metacognitive writing strategies. The results of this study indicate that the problem-solving strategies are not sufficient for successful academic writing. Emotions regulation and sustained efforts help the students plan, monitor and evaluate their writing well. The study provides practical examples for language teaching and learning and adds to the ongoing debates on SLL in higher education.

Keywords: academic writing, cognitive strategies, effort regulation, affective strategies, metacognitive strategies

INTRODUCTION

Background of Study

Academic writing is often regarded to be one of the most difficult skills that students acquire while studying in university. Good language proficiency is not the only thing involved when writing at the tertiary level. Students should brainstorm and formulate ideas, develop logical arguments, edit their writing and remain focused while writing (Bruning et al., 2013; Hayes, 1996). These demands make academic writing a complex task that requires continuous decision-making and self-monitoring. As a result, students often use multiple learning strategies to cope with cognitive and emotional requirements of writing. They need to be motivated; control their own effort when they run into trouble; and make conscious decisions with respect to planning, drafting, and revising their efforts (Hayes & Flower, 1980; Zimmerman & Risemberg, 1997). Effective coordination of these processes is one of the things that often distinguishes successful writers from those who struggle in the academic writing tasks.

In addition to cognitive and metacognitive dimensions, affective factors have emerged as important influences on writing development. According to Kurniash et al. (2022), learners' motivation, self-efficacy, and emotional regulation have significant impacts on their involvement in writing tasks. Similarly, Liu (2023) traced the impact of confidence and anxiety on students' writing experience, and Savasci (2026) discovered that the positive emotional state is effective in improving students' academic writing achievement and maintaining students' interest in learning. Thus, it can be concluded that emotional factors are able to affect students' use of cognitive and metacognitive strategies in writing, as reflected in students' difficulties in applying these strategies.

Although considerable attention has been given to cognitive, metacognitive, and affective strategies in academic writing, these variables have often been examined in isolation. Some studies, such as Thung (2023) and Rosdiana et al. (2023), emphasized the role of cognitive and metacognitive strategies in writing achievement whereas other studies provided attention to affective strategies including self-efficacy, self-confidence, anxiety, and motivation by Kurniash et al. (2022), Liu (2023) and Savasci (2026). Although these are helpful insights, there is not yet much research that has examined these dimensions in an integrated way. Further, there is no empirical evidence yet regarding the mediation role of affective strategies between effort regulation and cognitive strategies on metacognitive writing strategies development. It is crucial to explore these connections to understand that writing is not only a thinking process. Students' emotion management, motivation, and persistence in difficulties may affect their planning, monitoring and evaluating of writing processes (Zimmerman, 2000; Liu, 2023). More detailed information about these interactions, then, might yield more information about how students regulate their writing and, ultimately, enhance their academic performance.

By integrating perspectives from Self-Regulated Learning Theory (Zimmerman, 2000), Metacognition Theory (Flavell, 1979), and Cognitive Load Theory (Sweller, 1988), this study seeks to provide a more comprehensive understanding of how students regulate their cognitive and emotional resources during academic writing. It is hoped that the findings will offer theoretical and practical implications for the role of affective strategies in facilitating the formation of effective metacognitive writing strategies.

Research Objective, Research Questions, and Hypothesis

The main objective of this study is to present a model that examines the relationship between cognitive strategies, effort regulation, and metacognitive writing strategies. In addition, this study also investigates the mediating role of affective factors in academic writing. To achieve these objectives, five research questions and corresponding hypotheses were formulated (Table 1). The research questions are addressed through SmartPLS analysis using both measurement and structural model assessments.

Table 1- Distribution of Research Objectives, Questions, and Hypotheses

Research Objectives	Research Questions	Research Hypotheses
To investigate if there is a significant relationship between Effort Regulation and Affective Strategies	Is there a significant relationship between Effort Regulation and Affective Strategies?	Ho1: There is no significant relationship between Effort Regulation and Affective Strategies
To investigate if there is a significant relationship between Effort Regulation and Metacognitive Strategies	Is there a significant relationship between Effort Regulation and Metacognitive Strategies?	Ho2: There is no significant relationship between Effort Regulation and Metacognitive Strategies
To investigate if there is a significant relationship between Cognitive Strategies and Affective Strategies	Is there a significant relationship between Cognitive Strategies and Affective Strategies?	Ho3: There is no significant relationship between Cognitive Strategies and Affective Strategies
To investigate if there is a significant	Is there a significant relationship	Ho4: There is no significant

relationship between Cognitive Strategies and Metacognitive Strategies	between Cognitive Strategies and Metacognitive Strategies?	relationship between Cognitive Strategies and Metacognitive Strategies
To investigate if there is a mediating effect between Affective Strategies and Metacognitive Strategies	Is there a mediating effect between Affective Strategies and Metacognitive Strategies	Ho5: There is no significant mediating between Affective Strategies and Metacognitive Strategies

LITERATURE REVIEW

Theoretical Framework

Self-Regulated Learning Strategies

The theory of self-regulated learning (SRL) (Zimmerman, 2000) states that successful learners are pro-active in their own learning process by planning, monitoring and evaluating their learning process, namely their cognitive, motivational and behavioral aspects. SRLs employ strategic actions to meet learning objectives and demonstrate motivation and persistence when encountering obstacles. In the context of writing, this theory supports the use of cognitive strategies and effort regulation as critical components of good learning. Cognitive strategies, such as organizing ideas, summarizing information, revising drafts, and applying appropriate language structures, help learners process and construct meaningful written content. At the same time, effort regulation enables students to sustain concentration, manage distractions, and continue writing despite challenges such as low motivation or complex tasks. Learners' affective factors, including anxiety, confidence, and emotional control, influence how effectively these strategies are applied. Therefore, affective factors may mediate the relationship between cognitive strategies, effort regulation, and metacognitive writing strategies, as emotionally resilient learners are more likely to regulate their learning behaviors and apply writing strategies successfully.

Metacognition Theory

According to Flavell's (1979) Metacognition Theory, learners become more effective when they are aware of and able to regulate their own thinking processes. Metacognition is defined as the knowledge and control individuals have over their cognitive activities, including planning, monitoring, and evaluating learning tasks. In the context of writing, this theory provides a strong foundation for the use of metacognitive writing strategies because effective writing requires continuous self-awareness and self-regulation throughout the writing process.

Writers who apply metacognitive strategies can plan their ideas before writing, monitor their progress while composing, and evaluate the quality of their work after completing a draft. These strategies help learners identify weaknesses, revise content, and improve coherence and organization in writing. Furthermore, metacognitive awareness enables students to select appropriate cognitive strategies and regulate their effort when encountering writing difficulties. This theory also supports the role of affective factors, such as motivation, confidence, and anxiety, because emotional states can influence learners' ability to monitor and control their writing processes effectively. Therefore, metacognitive strategies play a crucial role in enhancing writing performance and supporting self-regulated learning.

Cognitive Load Theory

Sweller's (1988) Cognitive Load Theory suggests that learners' working memory capacity is limited when they are learning new material, and that learning is less effective when cognitive loads are higher than the learner's working memory capacity. Excessive mental load of the learner may hinder comprehension, problem solving and task performance, particularly in complex tasks like writing.

Students' writing contexts require them to think about ideas, plan content, use grammatical principles, and check for coherence, all at once, and with a high cognitive load. This theory validates the significance of affective strategies since the learner's anxiety, stress, confidence and motivation have direct effects on their cognitive processing. Students' negative emotions can overwhelm their working memory, which can affect their capacity to utilize the cognitive and metacognitive writing strategies appropriately.

Affective strategies, such as self-encouragement, anxiety management, positive self-talk, and emotional regulation, help learners reduce psychological stress and maintain focus during writing tasks. By managing emotional states, learners can allocate more cognitive resources to planning, organizing, and revising their writing. Therefore, Cognitive Load Theory justifies the mediating role of affective factors in strengthening the relationship between cognitive strategies, effort regulation, and metacognitive writing strategies, ultimately enhancing writing performance and self-regulated learning.

Past Studies

Past studies on Strategies in Academic Writing

Previous research has focused on the significance of writing strategies in improving students' academic writing performance with a focus on cognitive, metacognitive, affective and effort regulatory strategies. Thung (2023) showed that high proficiency students used writing strategies more frequently than did medium and low proficiency students during the pre-, during, and post-writing stages. There was evidence of effort regulation in high proficiency students who studied outside of class, discussed with peers or teachers about ideas prior to writing. They also used cognitive techniques including linking prior knowledge to new information, editing grammar, vocabulary, and spelling errors, and editing punctuation errors once they had written their first drafts. In contrast, low proficiency students tended to use translation, dictionary and grammar books to a high degree for writing, suggesting a lack of strategic flexibility and reliance on surface level cognitive supports.

Similarly, Rosdiana et al. (2023) highlighted the significant contribution of metacognitive strategies to academic writing ability among university students. Their findings revealed that planning, monitoring, evaluation, information management, and debugging strategies positively influenced students' writing performance and reflective awareness during the writing process. The study also recommended that students' metacognitive awareness can be used to control learning more effectively and enhance their academic writing results. These findings are supported by Sagredo-Ortiz and Kloss (2025) who pointed out that strategies are cognitive and metacognitive processes and that they are necessary not only in text production but also as learning tools. Their study has created a measuring instrument to measure the use of students' academic writing strategies in various subjects, which is also an increasing awareness of strategic writing behavior in higher education. These studies collectively show that the ability of learners to control effort, use cognitive and metacognitive strategies, and manage the affective aspects of the writing process is crucial to successful academic writing.

Past Studies on Affective Strategies in Academic Writing

Previous studies have highlighted the significant influence of affective strategies in students' academic writing, especially in second language (L2) writing context. It is important to note that affective factors like anxiety, self-efficacy and motivation play a strong role in engagement and performance in academic writing among students (Kurniash et al., 2022). The results indicated that students with higher confidence and emotional regulation are more likely to engage in writing activities and continue when they encounter challenges. Likewise, Liu (2023) explored the role of affective aspects in English writing teaching and pointed out that a lot of college students have difficulties in learning English because of emotional factors. The study was based on Krashen's affective filter theory and concluded that motivation, self-confidence and anxiety have direct impact on students' learning and performance in English writing. It was also suggested in the study that the right teaching methods which can decrease the anxiety level and increase students' confidence can help to improve students' writing skills.

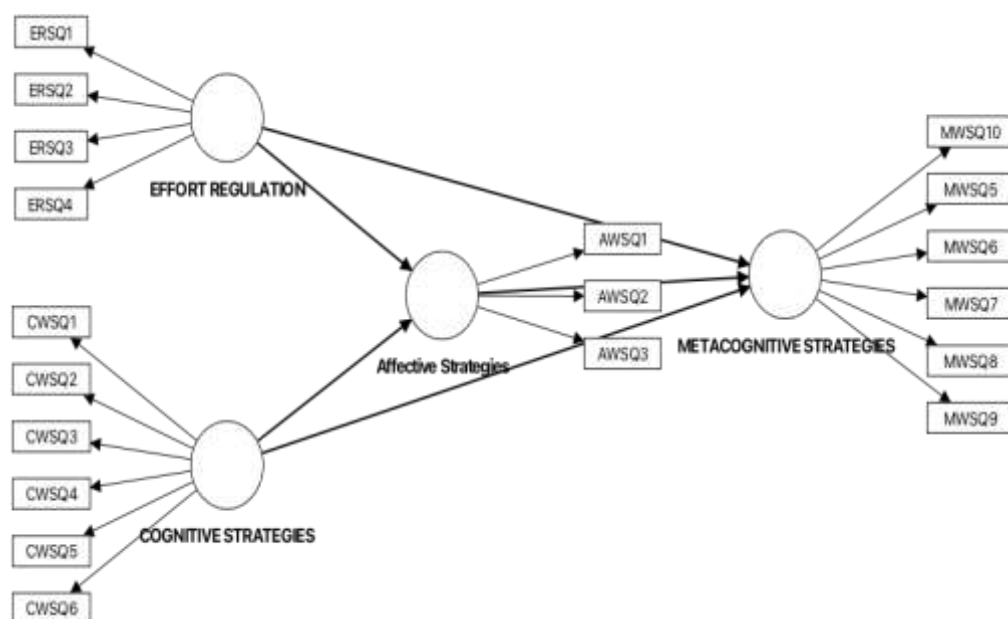
In addition, Savasci (2026) explored the relationship between individual difference factors and academic writing development among university students in English academic writing contexts. The study focused on variables such as writing anxiety, self-efficacy, motivation, enjoyment, and attitudes, and examined how these affective dimensions interact over time. Findings suggested that positive affective conditions contribute to better writing achievement and sustained engagement in academic writing tasks. Together, these studies indicate that affective strategies play a crucial role in academic writing by helping learners regulate emotions, maintain motivation, reduce anxiety, and strengthen confidence, all of which contribute to improved writing performance and learning outcomes.

Conceptual Framework and Proposed Model of the Study

The conceptual framework (Figure 1) of this study is grounded in the theory of Self-Regulated Learning (SRL) proposed by Zimmerman (2000), which emphasizes learners' active control over their cognitive, motivational, and behavioral processes during learning. In the context of academic writing, cognitive strategies and effort regulation are considered essential components of self-regulated learning that enable students to organize ideas, process information, sustain motivation, and persist in challenging writing tasks. Cognitive strategies involve techniques such as summarizing, organizing, rehearsing, and connecting prior knowledge with new information, while effort regulation reflects students' ability to maintain concentration and continue working despite difficulties or distractions. Students who can effectively manage effort and engage in suitable cognitive processes are more likely, according to Zimmerman's theory, to show higher levels of engagement in writing activities and improved writing performance. Thus, the framework is based on the premise that cognitive strategies and effort regulation are important factors of metacognitive writing strategies.

The framework further draws on the Metacognition Theory by Flavell (1979), which explains that successful learning depends on learners' awareness and regulation of their own cognitive processes. Metacognitive writing strategies, such as planning, monitoring, evaluating, and revising, enable students to manage and reflect upon their writing process more effectively. In addition, the mediating role of affective factors is justified through Sweller's (1988) Cognitive Load Theory, which posits those emotional conditions such as anxiety, motivation, and self-confidence influence learners' cognitive processing capacity. High anxiety and negative emotions may increase cognitive load and hinder writing performance, whereas positive affective conditions can support strategic learning and efficient cognitive functioning. Therefore, the framework assumes that affective factors mediate the relationship between cognitive strategies, effort regulation, and metacognitive writing strategies, as students with stronger emotional regulation and motivation are more capable of applying effective metacognitive strategies in academic writing.

Figure 1 - The Conceptual Framework of the Study



METHODOLOGY

Research Design

This study employs a quantitative design. The research goal is to explore the relationship between effort regulation and cognitive strategies on metacognitive strategies through the mediation of affective strategies. The model (Figure 1) chosen for this study is a hierarchical component model, Type II, which utilizes a combination of formative models. According to Fornell and Bookstein (1982), a formative model is a statistical and conceptual measurement approach where a construct is formed by its individual indicators rather than caused by them. The arrows in a formative model point from the indicators to the construct. In this study, the constructs are effort regulation with 4 indicators, cognitive strategies with 6 indicators, and metacognitive strategies with 6 indicators. The construct affective strategies (with 3 indicators) are used to test its mediating effect.

Population and Sample

The demographic analysis is presented in percentages. According to Ziegenfuss (2021), researchers report demographic data in percentages to establish sample representatives and allow for generalizability to a larger population. Presenting in percentages also provides an overview of participants' characteristics and offers a clear and understandable picture of the sample makeup.

Table 2 - Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	70%
		Female	30%
2	Level	Bachelor	77%
		Post-Graduates	23%
3	Cluster	Science & technology	14%
		Social Sciences and Humanities	86%
4	Level of Writing Proficiency	Low	7%
		Intermediate	75%
		High	18%

A total of 202 students participated in this study. They were students who attended an academic writing course in a public university in Malaysia. 70% of the participants are male, while 30% are female. Next, 77% of the respondents were students pursuing their bachelor's degree, and 23 % were postgraduate students. The participants belong to two main clusters: science & technology (14%) and social sciences and humanities (86%). Lastly, 7% reported they had low writing proficiency, 75% reported they had intermediate writing proficiency while 18% reported high writing proficiency.

Instrument

Table 3 presents the distribution of items included in the questionnaire. The instrument used a 5 Likert scale with scale 1 is never. Scale 2 represents rarely. Scale 3 represents sometimes, while scale 4 is often and scale 5 is always.

Table 3 - Distribution for Item in Instrument

Section	Writing Strategy	No Of Items
A	Metacognitive	6
B	Effort Regulation	4
C	Cognitive	5
D	Affective	3
		18

The questionnaire was adapted from Raoofi, et.al (2017) and consists of four main sections with a total of 18 items; section A is Metacognitive with 6 items, B is Effort regulation with 4 items, C is Cognitive with 5 items, and D is Affective writing strategies with 3 items.

Data Collection and Data Analysis

Data were collected using a Google Form and analysed using SmartPLS 4. As suggested by Hair, et.al. (2017), the analysis was conducted in two stages: the measurement model and the structural model. The first stage involved assessing the measurement model, which evaluated the outer model. The second stage focused on the structural model, which examined the relationships among the constructs in the inner model. The analysed data was used to answer the research questions and to confirm the chosen model.

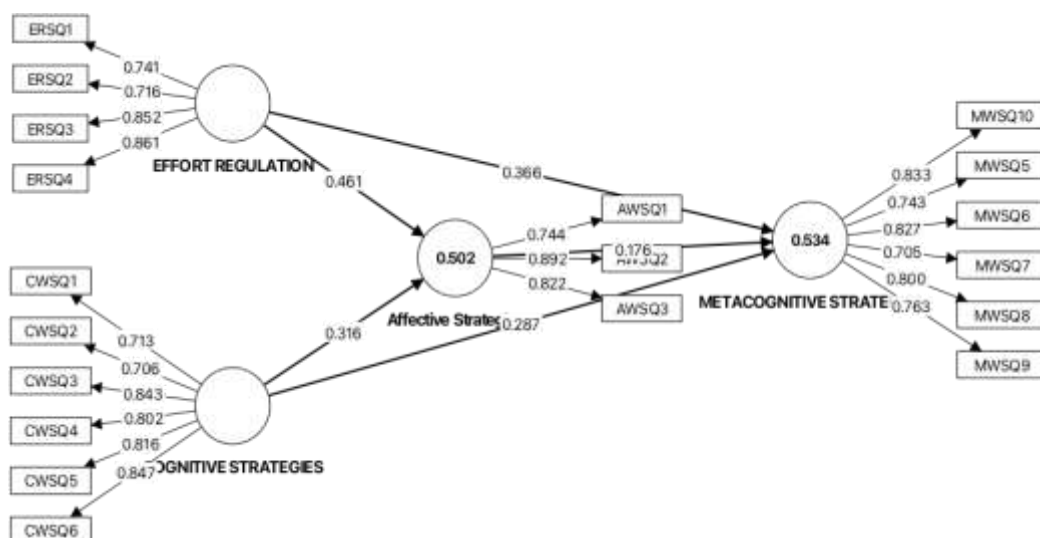
FINDINGS

The findings are presented in two stages. The first stage presents the measurement model, and the second stage presents the structural model and addresses the research questions.

Measurement Model

In SmartPLS, the measurement model is used to assess the reliability and validity of the constructs. This is done by examining the relationships between them and their observable behavior. The measurement model evaluated the outer model. Figure 3 below illustrates the measurement model employed for this study while the details of the analysis are presented in the subsequent tables.

Figure 3 - Measurement Model



Reliability

According to Ringle & Sarstedt (2016), reliability is assessed by checking both indicator reliability and internal consistency reliability. Internal consistency is evaluated using Composite reliability (ρ_c) and Cronbach's Alpha. The cut-off value for Cronbach's Alpha is 0.70 to 0.90. The cut-off values for composite reliability (ρ_c) are 0.70-0.90. For indicator reliability, the factor loadings cut-off values are >0.70 and squared loadings ≥ 0.50 . Finally, the cut-off values for Average Variance Extracted (AVE) ≥ 0.50 .

Table 4 - Results for Reliability- Effort Regulation

Construct/Item	Factor Loading	Cronbach's Alpha	Composite Reliability (ρ_c)	Average Variance Extracted (AVE)
		0.803	0.872	0.632
ERSQ1	0.741			
ERSQ2	0.716			
ERSQ3	0.852			
ERSQ4	0.861			

Table 4 presents the reliability results for Effort Regulation. The factor loading of all items was found to be between 0.716 and 0.861. The loadings comply with the indicator reliability of more than 0.7. Next, the Cronbach's Alpha for Effort Regulation is 0.803, the composite reliability is 0.872, and the AVE is 0.632.

Table 5 - Results for Reliability- Cognitive Strategies

Construct/ Item	Factor Loading	Cronbach's Alpha	Composite Reliability (ρ_c)	Average Variance Extracted (AVE)
		0.879	0.908	0.624
CWSQ1	0.713			
CWSQ2	0.706			
CWSQ3	0.843			
CWSQ4	0.802			
CWSQ5	0.816			
CWSQ6	0.847			

Table 5 presents the reliability results for the Cognitive Strategies. The factor loading of all items were found to be between 0.713 and 0.847. The loadings comply with the indicator reliability of more than 0.7. Next, the Cronbach's Alpha for Cognitive Strategies is 0.879, composite reliability is 0.908, and the AVE is 0.624.

Table 6 - Results for Reliability- Metacognitive Strategies

Construct/ Item	Factor Loading	Cronbach's Alpha	Composite Reliability (ρ_c)	Average Variance Extracted (AVE)
		0.871	0.903	0.608

MWSQ10	0.833	
MWSQ5	0.743	
MWSQ6	0.827	
MWSQ7	0.705	
MWSQ8	0.8	
MWSQ9	0.763	

Table 6 presents the reliability results for Metacognitive Strategies. The factor loading of all items were found to be between 0.705 and 0.833. The loadings comply with the indicator reliability of more than 0.7. Next, The Cronbach's Alpha for Metacognitive Strategies is 0.871, the composite reliability is 0.903 and AVE is 0.608.

Table 7 - Results for Reliability- Affective Strategies

Construct/Item	Factor Loading	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted (AVE)
		0.755	0.861	0.675
AWSQ1	0.744			
AWSQ2	0.892			
AWSQ3	0.822			

Table 7 presents the reliability results for the Affective Strategies. The factor loading of all items was found to be between 0.744 and 0.892. The loadings comply with the indicator reliability of more than 0.7. Next, the Cronbach's Alpha for Affective Strategies is 0.755, the composite reliability is 0.861, and the AVE is 0.675.

Validity

According to Ramayah et.al. (2018), the discriminant validity can be assessed using the Heterotrait-Monotrait Ratio (HTMT). An HTMT value between <0.85 or <0.90 is generally considered evidence of good discrimination validity.

Table 8 - Discriminant Validity (HTMT)

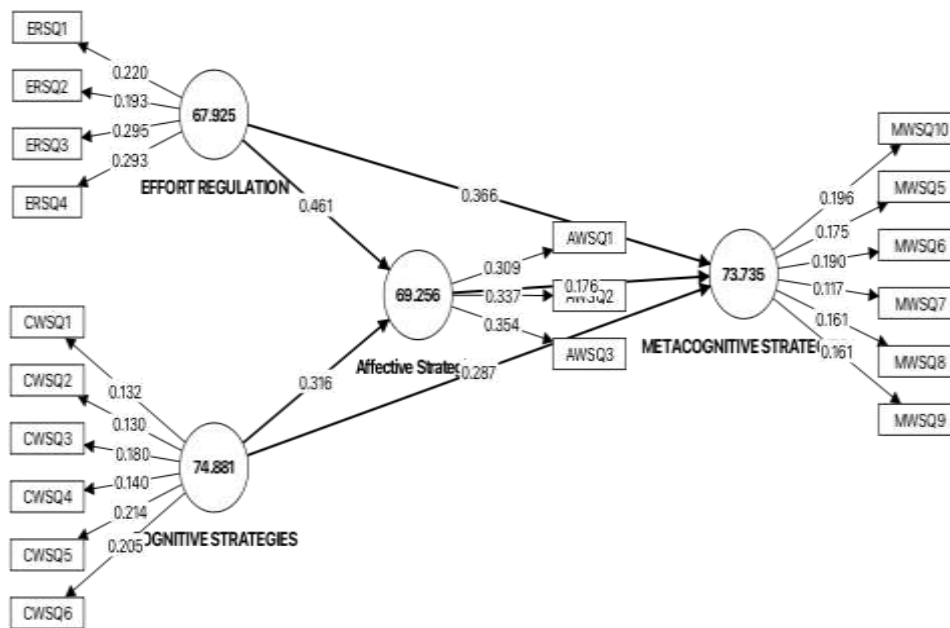
	Affective Strategies	Cognitive Strategies	Effort Regulation
Cognitive Strategies	0.752		
Effort Regulation	0.853	0.765	
Metacognitive Strategies	0.73	0.706	0.799

Table 8 presents the discriminant validity of the model. The HTMT for connectedness and autonomy is 0.889 and is therefore valid. The HTMT for Cognitive Strategies and Affective Strategies is 0.752. The HTMT for Effort Regulation and Affective Strategies is 0.853, for Effort Regulation and Cognitive Strategies is 0.765. Next, the HTMT for Metacognitive Strategies and Affective Strategies is 0.73, for Metacognitive Strategies and Cognitive Strategies is 0.706, and Metacognitive Strategies and Effort Regulation is 0.799.

Structural Model

In SmartPLS, the structural model visualizes the hypothesized causal relationships between constructs. The structural model is thus formed after the researcher has established the reliability and validity in the measurement model. For the analysis of the structural model, the researcher runs bootstrapping and examines the collinearity, path coefficients of determination, effect size, PLS predict, and IPMA. In addition to that, the analysis in the structural model allows the researcher to answer research questions 1-5 and hypotheses 1-5). Figure 4 below shows the structural model for this study. Detailed explanation is elaborated in Tables below.

Figure 4 - Structural Model Composing through Socio-Cultural theory



Collinearity

According to Ringle & Sarstedt (2016), the cut-off value for collinearity inner model VIF is ≤ 5.0 .

Table 8 – Collinearity

	Original sample (O)
Affective Strategies -> Metacognitive Strategies	2.009
Cognitive Strategies -> Affective Strategies	1.735
Cognitive Strategies -> Metacognitive Strategies	1.936
Effort Regulation -> Affective Strategies	1.735
Effort Regulation -> Metacognitive Strategies	2.161

Table 9 above presents the collinearity results for this study. According to Ringle et al. (2024), the inner model VIF must be less than or equal to 5.0. All interactions met the threshold for Collinearity.

Coefficients of determination (R^2)

According to Ramayah et. al. (2018) For coefficients of determination (R^2) 0.2 to 0.7, depending on the field of study. Social Sciences & Economics follows the range above.

Table 10 - R^2

	Original sample (O)
Affective Strategies	0.502
Metacognitive Strategies	0.534

Table 10 shows the results for coefficients of determination (R^2). Results indicate that the R^2 for Affective Strategies is 0.502 (50%) and Metacognitive Strategies is 0.534 (53%).

P-Value

Table 11 - Interpretation for p-value

Thresholds	Interpretation	Decision
$p \leq 0.05$	Often considered statistically significant	Reject H_0
$p \leq 0.01$	Indicates very strong evidence against H_0	Reject H_0
$p > 0.05$	Weak or no evidence against H_0	Fai to reject H_0

According to Goodman (1999), a threshold of p-value is the cut-off for determining statistical significance, most set at 0.05. Below is the table that interprets the threshold.

Table 11 shows the interpretation for p=value. According to Goodman (1999), if the p-value is $p \leq 0.05$, the data is often considered statistically significant, and the hull hypothesis is rejected. If it is $p \leq 0.01$, then it indicates very strong evidence to reject the null hypothesis (H_0). However, a $p > 0.05$ is considered weak, and there is no evidence to reject the null hypothesis.

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$p > 0.05$	Weak or no evidence against H_0	Fai to reject H_0

Table 12-Path Coefficient for current study

	T statistics (O/STDEV)	P values
Cognitive Strategies -> Affective Strategies	3.882	0
Cognitive Strategies -> Metacognitive Strategies	3.481	0.001
Effort Regulation -> Affective Strategies	5.925	0
Effort Regulation -> Metacognitive Strategies	4.346	0
Affective Strategies -> Metacognitive Strategies	2.27	0.023

Table 12 presents data to answer research questions and hypotheses. Path coefficients are presented in beta and t-value. The significant value (t-statistic) must be more than 1.65, and p-values must be less than 0.05 to show

significant relationships. The p-value for connectivism $\rightarrow$ autonomy is $p=0$ ($t=10.045$); for connectivism $\rightarrow$ connectedness is $p=0$ ($t=12.787$); for connectivism $\rightarrow$ diversity is $p=0$ ($t=8.068$), and connectivism $\rightarrow$ openness is $p=0$ ($t=8.543$). Hence, all paths indicate significant relationships.

Effect Size (f^2)

Following the guidelines proposed by Ramayah et.al. (2018) and supported by Ringle et al. (2024), effect sizes(f^2) values of 0.02, 0.15, and 0.35 indicate small, medium, and large effects respectively.

Table 13- Effect Size

	Original sample (O)	Interpretation
Effort Regulation $\rightarrow$ Affective Strategies	0.246	medium
Effort Regulation $\rightarrow$ Metacognitive Strategies	0.133	small
Cognitive Strategies $\rightarrow$ Affective Strategies	0.116	small
Cognitive Strategies $\rightarrow$ Metacognitive Strategies	0.091	small
Affective Strategies $\rightarrow$ Metacognitive Strategies	0.033	small

With reference to Table 12 above, all interactions proposed in the model show significant effects. The effect of Effort Regulation and Affective Strategies is medium; and Effort Regulation and metacognitive Strategies is small. Next, the interaction between Cognitive Strategies and Affective Strategies shows small effect; and Cognitive and Metacognitive strategies has small effect. Finally, there is significant mediating small effect for Affective strategies and Metacognitive Strategies.

PLS Predict (Q^2)

In PLS-SEM, it is stated that $Q^2 \geq 0$ (Ringle et. al., 2024). Table 18 below reveals the PLS Predict (Q^2) for the dependent variable. The analysis reveals the Q^2 for all items in the dependent variable-connectedness.

Table 14- PLS Predict (Q^2)

	Q^2 predict	RMSE	MAE
Affective Strategies	0.486	0.726	0.547
Metacognitive Strategies	0.5	0.716	0.538

Table 14 above shows the results for Q^2 Predict in the study. According to Cohen (1988), Q^2 Predict is used to interpret the magnitude of the predictive relevance. For $Q^2 \geq 0$ indicates the model has predictive relevance. Secondly, 0.02 indicates small predictive relevance. Next, 0.15 indicates medium predictive relevance. Finally, 0.35 indicates predictive relevance. Results for Table 14 shows that all variables indicate predictive relevance. Specifically Affective Strategies have a large predictive relevance, and Metacognitive Strategies have a large predictive relevance. The results, therefore, confirm the goodness of the model predicted in this study.

IPMA

To gain further insight into the findings, an Importance-Performance Matrix Analysis (IPMA) was conducted. According to Ringle & Sarstedt (2016), IPMA enables researchers to assess not only the importance of a construct but also its level of performance within a model. In the context of this study, individual IPMA analysis was done on each construct and reported in Tables 15 and 16.

Table 15- Latent Variables Average Performance (Performance)

	LV performance value, average
Effort Regulation	67.925
Cognitive Strategies	74.881
Metacognitive Strategies	73.735
Affective Strategies	69.256

Table 16-Total Effects showing Importance analysis

	Total effects
Effort Regulation -> Affective Strategies	0.461
Effort Regulation -> Metacognitive Strategies	0.448
Cognitive Strategies -> Affective Strategies	0.316
Cognitive Strategies -> Metacognitive Strategies	0.343
Affective Strategies -> Metacognitive Strategies	0.176

According to Hauf (2024), for PLS-SEM IPMA (Importance-Performance Map Analysis), there is not a single "good score," but rather constructs with high importance (total effects) but low performance scores (rescaled 0-100) are key areas for improvement, indicating high potential for managerial action, while high importance/high performance is good, and low importance/low performance means less priority. Performance scores range 0-100, with higher values showing better attainment, but interpret as *relative* to their importance.

Hence, for the Effort Regulation and Affective Strategies, there is low importance/ medium performance (Importance=0.461, Performance=67.925). There is also low importance/moderate performance for Effort Regulation and Metacognitive Strategies (Importance=0.448, Performance=67.925). Cognitive Strategies and Affective Strategies, there is low importance/high performance (Importance=0.316, Performance=74.881). There is also low importance/high performance for Cognitive Strategies and Metacognitive Strategies (Importance=0.343, Performance=73.735). Lastly, there is low importance/moderate performance (Importance=0.176, Performance=69.256) for Affective Strategies and Metacognitive Strategies.

CONCLUSION

Summary of Findings and Discussions

Table 17- Outcome of Research Hypothesis

No.	Research Question	Research Hypothesis	Outcome
1	Is there a significant relationship between Effort Regulation and Affective Strategies?	H ₀₁ : There is no significant relationship between Effort Regulation and Affective Strategies	Reject null hypothesis There is a relationship between Effort Regulation and Affective Strategies. The effect is medium.

2	Is there a significant relationship between Effort Regulation and Metacognitive Strategies?	Ho2: There is no significant relationship between Effort Regulation and Metacognitive Strategies	Reject null hypothesis There is a relationship between Effort Regulation and Metacognitive Strategies. The effect is small.
3	Is there a significant relationship between Cognitive Strategies and Affective Strategies?	Ho3: There is no significant relationship between Cognitive Strategies and Affective Strategies	Reject null hypothesis There is a relationship between Cognitive Strategies and Affective Strategies. The effect is small.
4	Is there a significant relationship between Cognitive Strategies and Metacognitive Strategies?	Ho4: There is no significant relationship between Cognitive Strategies and Metacognitive Strategies	Reject null hypothesis There is a relationship between Cognitive Strategies and Metacognitive Strategies. The effect is small.
5	Is there a mediating effect between Affective Strategies and Metacognitive Strategies	Ho5: There is no mediating effect between Affective Strategies and Metacognitive Strategies	Reject null hypothesis. There is a small mediating effect between Affective Strategies and Metacognitive Strategies

Table 17 above shows the presentation of the outcome of the research questions and hypotheses. The null hypothesis is rejected for all research hypotheses 1-5. All interactions show significant relationships. The results revealed that Affective Strategies have a mediating effect from Effort Regulation to Metacognitive Strategies. In addition to that, there is also a mediating effect from Cognitive Strategies to Metacognitive Strategies.

The findings indicate that affective strategies play an important mediating role between effort regulation and metacognitive strategies in academic writing. Studies by Kurniash et al. (2022), Liu (2023), and Savasci (2026) consistently showed that motivation, self-efficacy, confidence, and reduced anxiety positively influence students' writing performance and learning engagement. These affective factors help learners regulate their emotions, persist in difficult writing tasks, and maintain focus during the writing process, thereby enhancing their metacognitive abilities such as planning, monitoring, and evaluating writing. Similarly, Zhang et al. (2022) found that supportive online peer feedback environments fostered positive emotions and increased learner engagement, which further encouraged reflective and self-regulated writing behaviors. These findings support the idea that affective strategies mediate metacognitive strategies by improving students' emotional readiness and sustained effort in academic writing tasks.

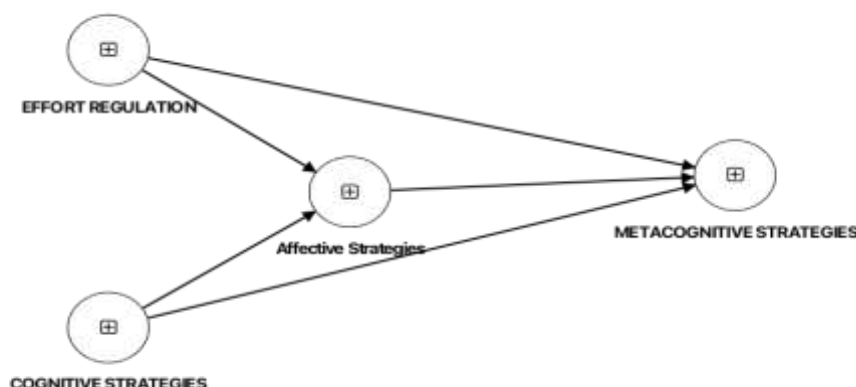
The findings also demonstrate that affective strategies also mediate the interaction between cognitive strategies and metacognitive strategies in academic writing. Thung (2023) revealed that high-proficiency students frequently used cognitive and self-regulatory strategies such as brainstorming, revising, editing, and connecting prior knowledge with new learning, while low-proficiency students relied more on translation, grammar checking, and dictionary use. This suggests that effective cognitive strategy use enhances higher-order metacognitive processes. Likewise, Rosdiana et al. (2023) emphasized that metacognitive strategies are closely linked with declarative, procedural, planning, monitoring, and evaluation strategies, all of which contribute significantly to academic writing ability. Sagredo-Ortiz and Kloss (2025) further supported this relationship by confirming that academic writing strategies involve both cognitive and metacognitive operations that help students manage and improve their writing performance across disciplines. Collectively, these studies indicate that cognitive strategies serve as an important mechanism through which metacognitive strategies influence academic writing achievement.

Implications and Suggestions for Future Research

Figure 5 below presents the proposed model for the relationship between effort regulation and cognitive strategies on metacognitive strategies through the mediation of affective strategies. There are several important implications of the study for academic writing instruction and learner development. The results indicate that affective strategies such as effort regulation, motivation, self-confidence and anxiety management are crucial factors to boost metacognitive strategies and student writing performance. Teachers, therefore, should employ teaching methods that foster positive and non-threatening learning environments where students learn to manage their emotions, maintain motivation, and persevere in completing difficult writing tasks. Collaborative tasks, feedback and emotional supports from peers can be used by teachers to build student confidence and interest in academic writing tasks.

Second, the study highlights the importance of cognitive strategies as mediators of metacognitive strategy use. Since successful students actively employ planning, monitoring, revising, and self-evaluation strategies, writing instructors should explicitly teach cognitive and metacognitive writing strategies as part of the writing curriculum. The training of brainstorming and organizing ideas, reflective thinking, self-editing and error analysis can enhance students' self-regulated learning and academic writing performance. The results further suggest that by incorporating the affective and cognitive aspects of writing, teachers could contribute to more autonomy, reflective and effective writing in the academic literacy of students.

Figure 5- The Proposed Model



Future researchers should further examine the mediating and moderating roles of affective and cognitive strategies in different educational and cultural contexts. As the present study was limited to the focus on motivation, self-efficacy, anxiety, effort regulation and cognitive writing strategies, further research should be conducted with different variables including resiliency, emotional intelligence, learner autonomy, digital literacy, and social support as they can be a determinant factor on how metacognitive strategies are related to academic writing. The researchers can also explore if these relationships vary by gender, proficiencies, disciplines, and/or learning environments including face-to-face, blended and online learning.

Furthermore, longitudinal or mixed-method research design could be used in future research to gain a better understanding of the changes in students' writing strategies and emotion along the passage of time. Experimental studies can also be done to evaluate the efficacy of certain teaching strategies that are specifically developed to enhance affective regulation, cognitive strategies, and metacognitive awareness in writing classrooms. Moreover, researchers can extend beyond the scope of English language learners to other multilingual or interdisciplinary contexts to increase the generalizability of the research results and help develop more complete models of academic writing development.

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APPENDIX

Writing Strategy Categories

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

Frequency

1	Never
2	rarely
3	Sometimes
4	Often
5	Always

Section	Writing Strategy	No Of Items
A	Metacognitive	6
B	Effort Regulation	4
C	Cognitive	5
D	Affective	3
		18

Part 2-Mteacognitive (Mws)

ITEM
MWSQ 5I evaluate and re-evaluate the ideas in my essay.
MWSQ 6I monitor and evaluate my progress in writing.
MWSQ 7I 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.

Part 3-Effort Regulation (Ers)

ITEM
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 3Even if the writing activities are difficult, I don't give up but try to engage in them.
ERSQ 4I concentrate as hard as I can when doing a writing task.

Part 4-Cognitive (Cws)

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

Part 5-Affective (Aws)

ITEM
AWSQ1I try to write an essay in class with confidence and ease.
AWSQ2I try to relax whenever I feel afraid of writing.
AWSQ3I encourage myself to write even when I am afraid of making mistakes