The Relationship Between Learning Strategies and Critical Thinking Among Undergraduates

***[1]Nur Hazirah Mohd Fuat; [2]Nurshahirah Azman; [3]Mirrah Diyana Maznun; [4]Noor Fazzrienee JZ Nun Ramlan; [5]Nur Waheedah Borhan**

[1,2,3,4]Academy of Language Studies, Universiti Teknologi MARA Perak Branch

[5]Sekolah Jenis Kebangasaan (C) Yuk Chai, Petaling Jaya

DOI: https://doi.org/10.47772/IJRISS.2026.100600597

Received: 10 June 2026; Accepted: 15 June 2026; Published: 30 June 2026

ABSTRACT

Critical thinking and learning strategies play important roles in supporting effective learning among undergraduates in higher education settings. Therefore, this study explores the relationship between learning strategies and critical thinking among undergraduates. Specifically, the study investigates learners' perceptions of critical thinking, cognitive strategies, metacognitive strategies, and resource management strategies, as well as the relationship between critical thinking and learning strategies. This study employed a quantitative survey research design involving 322 undergraduate students selected through convenience sampling. The instrument used was a 5-point Likert scale questionnaire adapted from Wenden and Rubin (1987) and Pintrich et al. (1991). The questionnaire consisted of 42 items covering cognitive strategies, metacognitive self-regulation, and resource management strategies. Data were analysed using descriptive statistics, inferential statistics, and correlation analysis. The findings revealed that learners generally demonstrated positive perceptions towards the use of critical thinking and learning strategies during learning activities. The study also found significant positive relationships between critical thinking and cognitive, metacognitive, and resource management strategies. However, no significant differences were found across faculties and SPM English achievement backgrounds. Overall, the findings suggest that critical thinking plays an important role in influencing learners' use of learning strategies in higher education contexts. The study provides useful pedagogical implications for promoting active and self-regulated learning among undergraduates.

Keywords: Critical thinking, learning strategies, cognitive strategies, metacognitive strategies, resource management

INTRODUCTION

Background of Study

Learning strategies have long been recognised as important factors that influence learners' academic performance and learning processes. In higher education settings, students are expected to become more independent learners capable of managing their learning effectively and adapting to increasingly demanding academic tasks. As a result, learners often use different strategies to process, organise, monitor, and regulate their learning experiences. According to Anita Wenden and Joan Rubin (1987), learning strategies are the techniques or actions learners use to facilitate the acquisition, storage, retrieval, and use of information during learning activities.

Learning strategies are commonly categorised into cognitive, metacognitive, and resource management strategies. Cognitive strategies involve mental processes such as rehearsal, elaboration, organisation, and critical thinking that assist learners in understanding and processing information effectively. Metacognitive strategies refer to learners' ability to plan, monitor, and regulate their learning processes, while resource management strategies involve the management of study environments, effort, and help-seeking behaviours during learning (Pintrich et al., 1991). These strategies are essential in helping learners become more active and self-regulated learners in academic settings.

In recent years, critical thinking has also gained increasing attention in higher education due to its importance in preparing students for academic, professional, and real-world problem-solving contexts. Critical thinking is often associated with learners' ability to analyse information, evaluate arguments, question assumptions, and make reasoned judgments based on evidence. According to Facione (1990), critical thinking involves purposeful and reflective judgment that includes interpretation, analysis, evaluation, and inference. In language learning contexts, critical thinking enables learners to engage more actively with learning materials, interpret information critically, and develop independent perspectives during learning activities.

The integration of critical thinking into learning processes has become increasingly relevant in higher education as learners are expected to move beyond memorisation-based learning towards more analytical and reflective learning practices. Learners who demonstrate stronger critical thinking skills are often more capable of selecting and applying appropriate learning strategies to support their academic learning. Rahmat (2021) states that learners use cognitive and metacognitive strategies when engaging in learning tasks that require reading, thinking, and problem-solving processes. This suggests that critical thinking may play an important role in influencing the use of learning strategies among undergraduate learners.

Therefore, this study explores the relationship between learning strategies and critical thinking among undergraduates. Specifically, this study focuses on the relationship between critical thinking and three dimensions of learning strategies, namely cognitive strategies, metacognitive self-regulation, and resource management strategies among undergraduate students in a higher education institution.

Statement of Problem

The increasing emphasis on critical thinking in higher education has encouraged researchers to investigate the factors that contribute to learners' development of critical thinking. In modern educational settings, students are expected not only to acquire knowledge but also to evaluate information critically, solve problems effectively, and apply knowledge meaningfully in various contexts. Despite this expectation, many learners continue to rely heavily on surface-level learning approaches such as memorisation and passive learning, which may hinder the development of higher-order thinking skills.

Previous studies have highlighted the importance of learning strategies in supporting learners' academic achievement and self-regulated learning processes. For instance, Pintrich et al. (1991) emphasised that cognitive, metacognitive, and resource-management strategies help learners regulate their learning processes more effectively. Similarly, Rahmat et al. (2020) reported that learners use different learning strategies to cope with academic tasks and learning challenges. These findings indicate that learning strategies play an important role in shaping learners' engagement with learning tasks. In addition, several studies have also examined critical thinking within language learning and higher education contexts. Facione (1990) argued that critical thinking involves reflective judgment and analytical reasoning, which are essential for effective learning and decision-making. Meanwhile, studies by Abrami et al. (2015) and Tiruneh et al. (2017) revealed that critical thinking skills can be enhanced through learning environments that encourage active learning, reflection, and problem-solving activities. These findings suggest that learners' ability to think critically may be influenced by the strategies they use during learning.

However, although many studies have investigated learning strategies and critical thinking separately, the relationship between critical thinking and specific learning strategy dimensions remains an area that requires further exploration, particularly among undergraduate learners in Malaysian higher education settings. Existing studies have frequently focused on academic achievement, motivation, self-regulated learning, and language performance without specifically examining how critical thinking is associated with cognitive, metacognitive, and resource management strategies simultaneously (Pintrich et al., 1991; Rahmat, 2021; Oxford, 1990). For instance, studies by Pintrich et al. (1991) and Zimmerman (2002) primarily examined learners' self-regulation and strategy use in relation to academic learning and motivation, while Rahmat (2021) focused on cognitive and metacognitive strategies in ESL writing contexts. Although these studies provide important insights into learners' strategy use, the relationship between critical thinking and different dimensions of learning strategies remains insufficiently explored.

Furthermore, most previous studies on learning strategies have concentrated on language proficiency, academic achievement, self-regulated learning, or online learning environments (Oxford, 1990; Rahmat et al., 2020; Teng, 2022), while fewer studies have explored the relationship between learning strategies and critical thinking across different faculties and English language achievement backgrounds among undergraduates. Studies investigating learning strategies often emphasise learners' academic performance or language learning outcomes rather than examining how critical thinking skills may influence learners' use of cognitive, metacognitive, and resource management strategies in higher education settings. Therefore, this creates a need to further investigate how learners' critical thinking is associated with their use of learning strategies among undergraduate learners in higher education contexts. Specifically, this study investigates the relationship between critical thinking and three learning strategy dimensions, namely cognitive strategies, metacognitive self-regulation, and resource management strategies across faculties and SPM English achievement levels.

Objectives of the Study and Research Questions

This study is done to explore the relationship between learning strategies and critical thinking. Specifically, this study is done to answer the following questions;

1. Are there significant differences in critical thinking and learning strategies across faculties among undergraduates?

2. Are there significant differences in critical thinking and learning strategies based on students' SPM English achievement?

3. What are the levels of critical thinking and learning strategies among undergraduates?

4. Is there a significant relationship between critical thinking and learning strategies among undergraduates?

LITERATURE REVIEW

Theoretical Framework of the Study

Critical Thinking in Language Learning

Critical thinking has become an essential component in higher education as learners are increasingly expected to analyse information, evaluate arguments, solve problems, and make informed decisions during learning activities. In educational contexts, critical thinking refers to learners' ability to engage in reflective and analytical thinking processes when interpreting information and constructing knowledge. According to Peter A. Facione (1990), critical thinking involves purposeful and self-regulatory judgment, which includes interpretation, analysis, evaluation, inference, and explanation. In language learning contexts, critical thinking enables learners to move beyond passive learning and engage more actively with learning materials through questioning, reasoning, and evaluating ideas critically. Learners who demonstrate critical thinking skills are often more capable of interpreting information meaningfully and applying knowledge in different learning situations. Additionally, critical thinking encourages learners to become more independent and reflective learners by enabling them to evaluate their own understanding and learning processes. Rahmat (2021) further states that learners use cognitive and metacognitive strategies when engaging in reading and thinking tasks, suggesting that critical thinking plays an important role in influencing learners' strategy use during learning activities. Therefore, critical thinking is considered an important element in higher education learning as it supports learners' ability to engage actively, reflect critically, and regulate their learning processes effectively.

Learning Strategies Dimensions

Learning strategies refer to the techniques, behaviours, and thought processes employed by learners to facilitate the acquisition, storage, retrieval, and use of information during learning activities. In language learning contexts, learning strategies help learners become more active, independent, and self-regulated in managing their learning processes. According to Anita Wenden and Joan Rubin (1987), learners employ different types of

strategies to support learning effectiveness, particularly cognitive, metacognitive, and resource management strategies. Cognitive strategies involve mental processes such as rehearsal, organisation, and elaboration that assist learners in processing and understanding information. Although critical thinking has been conceptualised as a subcomponent of cognitive strategies within the MSLQ framework (Pintrich et al., 1991), the present study examines critical thinking as a distinct construct to better understand its relationship with different dimensions of learning strategies. Metacognitive strategies refer to learners' ability to plan, monitor, and regulate their learning processes, while resource management strategies involve managing learning environments, effort, and help-seeking behaviours during learning activities. In addition, Pintrich et al. (1991) emphasise that learning strategies are important components of self-regulated learning as they enable learners to control and adapt their learning behaviours according to different academic tasks and learning situations. In higher education settings, learners who employ appropriate learning strategies are often more capable of engaging actively with course materials, managing learning challenges, and improving their academic learning experiences. Therefore, learning strategies are considered important elements in supporting learners' academic performance, independent learning, and critical engagement in higher education contexts.

Past Studies

Past Studies on Critical Thinking in Learning

Conceptual Framework of the Study

The conceptual framework of the study is presented in Figure 1 below. This study explores the relationship between critical thinking and on the use of learning strategies. Rahmat et al. (2020) state that learning is the maximisation of strategy use. During learning, learners make choices as to what strategies they need for different learning tasks. Learners use cognitive and metacognitive strategies for tasks that include reading and thinking (Rahmat, 2021). Throughout the learning process, learners often make decisions to fit different stages of the learning process. The decisions encourage learners to use their critical thinking skills.

According to Wenden and Rubin (1987), learners use three types of strategies in their learning: cognitive, metacognitive, and resource management. Cognitive strategies refer to learners' use of rehearsal, organisation, and elaboration techniques. Metacognitive strategies using planning techniques, while resource management involves the use of environment management, effort management, and help-seeking. Additionally, this study also explores the relationship between critical thinking and different learning strategies.

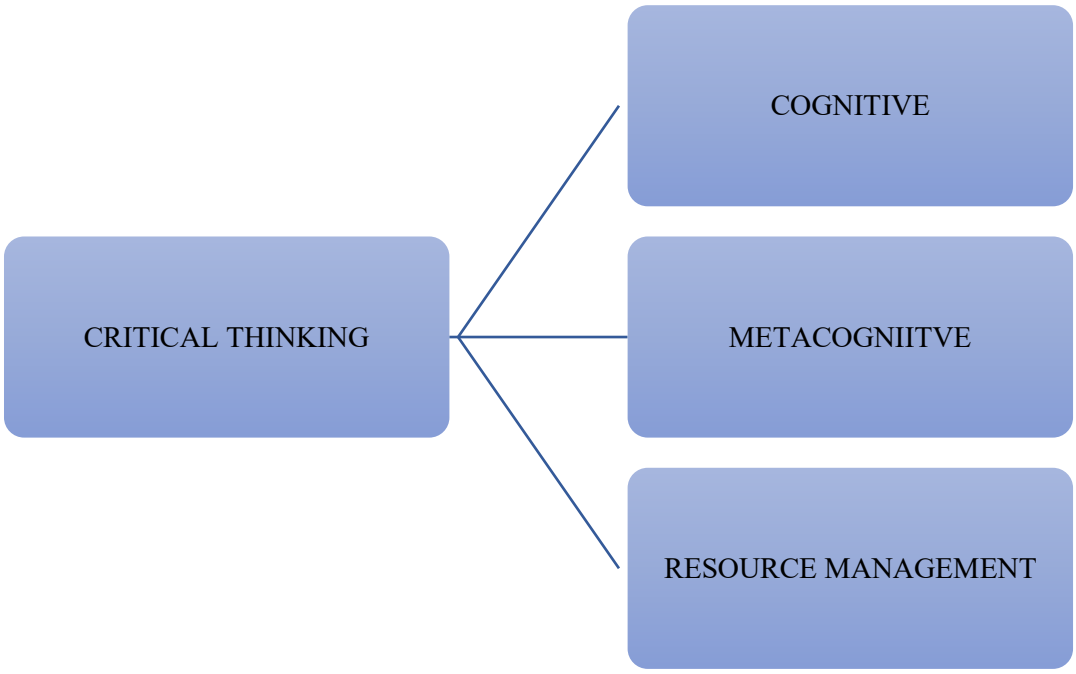

Figure 1: Conceptual Framework of the Study The Relationship between Critical Thinking and Learning Strategies

METHODOLOGY

This quantitative study is done to explore the relationship of learning strategies on critical thinking. A convenient sample of 322 participants responded to the survey. The instrument used is a 5 Likert-scale survey and is adapted from Wenden and Rubin (1987). Table 1 below shows the categories used for the Likert scale where 1 represents Never, 2 represents Rarely, 3 represents Sometimes, 4 represents Often, and 5 represents Always.

Table 1: Likert Scale Use

1	Never
2	rarely
3	Sometimes
4	Often
5	Always

Table 2: Distribution of Items in the Survey

	VARIABLE (KEYWORD)		CONSTRUCT	ITEM/ INDICATOR	TO ITEM	CA
A	COGNITIVE COMPONENTS	(a)	Rehearsal	4	14	.930
		(b)	Organization	4		
		(c)	Elaboration	6		
		(d)	Critical Thinking	5	5	.859
B	METACOGNITIVE SELF-REGULATION				11	.862
C	RESOURCE MANAGEMENT	(a)	Environment Management	4	12	.792
		(b)	Effort Management	4		
		(c)	Help-Seeking	4		
					42	.952

Table 2 shows the distribution of items in the survey adapted from Wenden and Rubin (1987) and Pintrich et al. (1991). The questionnaire consists of three main components: cognitive components, metacognitive self-regulation, and resource management, with a total of 42 items. The cognitive component consists of 19 items divided into rehearsal, organisation, elaboration, and critical thinking sub-constructs. Although critical thinking is included as a subscale within the original MSLQ cognitive strategy framework, it was analysed separately in this study to examine its relationship with the broader dimensions of learning strategies. Metacognitive self-regulation consists of 11 items, while resource management consists of 12 items covering environment management, effort management, and help-seeking. The reliability analysis recorded Cronbach's alpha values of .930 for cognitive components, .859 for critical thinking, .862 for metacognitive self-regulation, and .792 for resource management. The overall Cronbach's alpha value for all 42 items is .952, indicating good reliability of the instrument used in this study.

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

Table 3 also shows the reliability of the survey. The analysis is based on the information in Table 3, which reveals the reliability levels by Ahmad et al. (2024). The analysis shows a Cronbach alpha of .930 for cognitive components, .859 for critical thinking, .862 for metacognitive self-regulation and .792 for resource management. The overall Cronbach alpha for all 42 items is .952, thus revealing a good reliability of the instrument used. Further analysis using SPSS is done to present findings to answer the research questions for this study.

FINDINGS

Demographic Analysis

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

Table 4: Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	39%
		Female	61%
2	Faculty	Department of Built Environment Studies & Technology	76.8%
		Faculty of Art & Design	23.2%
3	SPM English	A+, A, A-	39%
		B+, B, B-	38%
		C - D (C+, C, D)	23%

Table 4 presents the demographic profile of the respondents involved in this study. In terms of gender, the majority of the respondents were female students (61%), while male students represented 39% of the total respondents. Regarding faculty distribution, most respondents were from the Department of Built Environment Studies and Technology (76.8%), followed by the Faculty of Art and Design (23.2%). In terms of SPM English achievement, the highest percentage of respondents obtained grades A+, A, and A- (39%), followed closely by students who obtained grades B+, B, and B- (38%). Meanwhile, respondents with grades C+ to D represented 23% of the total sample. Overall, the findings indicate that the respondents consisted predominantly of female undergraduates with relatively good English achievement backgrounds.

Inferential Statistics

According to Shah (2023), there are three main functions of a T-test. Firstly, T-tests are done to compare means. This test is also done to determine if the average scores (mean) or values of two groups, or one group against a known value, are different enough to be considered statistically meaningful and are not just due to random chance. Secondly, T-test is done to test hypotheses. Researchers use t-tests to test hypotheses about means, such as whether a new treatment significantly impacts a variable or if there's a difference in performance between two distinct groups. Lastly, T-test is used to identify significant differences. The output of a t-test provides a p-value (significance value). If this p-value is below a pre-determined threshold (often 0.05), it indicates a statistically significant difference, allowing researchers to conclude the populations from which their samples were drawn.

However, a one-way ANOVA (Analysis of Variance) is a statistical method used to compare the means of three or more independent (unrelated) groups to determine if there is a statistically significant difference between them. It is a parametric test that evaluates the effect of a single independent variable (the factor) on a dependent variable.

Findings for Critical Thinking and Learning Strategies Across Faculties

This section presents data to answer Research Question 1: Are there significant differences in critical thinking and learning strategies across faculties among undergraduates?

H_{o1}: There is no significant differences between (a) critical thinking and learning strategies (b. Cognitive, c. Metacognitive, and d. Resource Management) across faculties.

Table 5: T-Test for the Differences between Critical Thinking and Learning Strategies across Faculties

Group Statistics

	Q2FAC	N	Mean	Std. Deviation	Std. Error Mean
CRITICAL_THINKING	BUILT EVT & T	248	3.7702	.57975	.03681
	FAC A & D	74	3.8595	.64594	.07509
COGNITIVE	BUILT EVT & T	248	3.7713	.55010	.03493
	FAC A & D	74	3.8195	.53872	.06262
METACOGNITIVE	BUILT EVT & T	248	3.6356	.51821	.03291
	FAC A & D	74	3.6978	.51626	.06001
RESOURCE_MANAGEMENT	BUILT EVT & T	248	3.7981	.48285	.03066
	FAC A & D	74	3.7905	.48986	.05695

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance		Mean	Std. Error	95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Difference	Difference	Lower	Upper
CRITICAL_THINKING	Equal variances assumed	2.043	.154	-1.132	320	.129	.258	-.08930	.07888	-.24449	.06589
	Equal variances not assumed			-1.068	110.426	.144	.288	-.08930	.08363	-.25502	.07643
COGNITIVE	Equal variances assumed	.085	.770	-.664	320	.253	.507	-.04818	.07253	-.19087	.09450
	Equal variances not assumed			-.672	122.001	.251	.503	-.04818	.07171	-.19014	.09377
METACOGNITIVE	Equal variances assumed	.056	.812	-.906	320	.183	.365	-.06216	.06858	-.19709	.07277
	Equal variances not assumed			-.908	120.280	.183	.366	-.06216	.06844	-.19767	.07335
RESOURCE_MANAGEMENT	Equal variances assumed	.014	.905	.117	320	.453	.907	.00751	.06417	-.11874	.13376
	Equal variances not assumed			.116	118.519	.454	.908	.00751	.06467	-.12056	.13558

A two-sample T-test was performed to test the differences between critical thinking and learning strategies across faculties. Findings revealed there were no significant differences between (a) critical thinking (p=.258), (b)

cognitive (p=0.507), (c) metacognitive (p=0.365) and (d) resource management (p=0.907) across faculties. The null hypothesis is therefore accepted for research question 1.

4.2.2 Findings for Critical Thinking and Learning Strategies Across SPM English

This section presents data to answer Research Question 2: Are there significant differences in critical thinking and learning strategies based on students' SPM English achievement?

H_{o1}: There is no significant differences between (a) critical thinking and learning strategies (b. Cognitive, c. Metacognitive, and d. Resource Management) across SPM English scores

Table 6: T-Test for the Differences between Critical Thinking and Learning Strategies across SPM English

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
CRITICAL_THINKING	A	127	3.8614	.60711	.05387	3.7548	3.9680	2.20	5.00
	B	121	3.7488	.61619	.05602	3.6379	3.8597	2.00	5.00
	C	74	3.7378	.53474	.06216	3.6139	3.8617	2.60	5.00
	Total	322	3.7907	.59576	.03320	3.7254	3.8560	2.00	5.00
COGNITIVE	A	127	3.8121	.55400	.04916	3.7149	3.9094	2.14	5.00
	B	121	3.7928	.58448	.05313	3.6876	3.8980	2.00	5.00
	C	74	3.7143	.46712	.05430	3.6061	3.8225	2.79	5.00
	Total	322	3.7824	.54705	.03049	3.7224	3.8424	2.00	5.00
METACOGNITIVE	A	127	3.6407	.53130	.04715	3.5474	3.7340	1.91	5.00
	B	121	3.6394	.53034	.04821	3.5439	3.7348	2.00	5.00
	C	74	3.6830	.47661	.05540	3.5726	3.7935	2.73	5.00
	Total	322	3.6499	.51762	.02885	3.5932	3.7067	1.91	5.00
RESOURCE_MANAGEMENT	A	127	3.7972	.47659	.04229	3.7136	3.8809	2.42	5.00
	B	121	3.7927	.52054	.04732	3.6990	3.8864	2.17	5.00
	C	74	3.8007	.43745	.05085	3.6993	3.9020	2.75	5.00
	Total	322	3.7963	.48371	.02696	3.7433	3.8494	2.17	5.00

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
CRITICAL_THINKING	Between Groups	1.055	2	.527	1.490	.227
	Within Groups	112.877	319	.354		
	Total	113.932	321			
COGNITIVE	Between Groups	.469	2	.234	.782	.458
	Within Groups	95.594	319	.300		
	Total	96.063	321			
METACOGNITIVE	Between Groups	.106	2	.053	.196	.822
	Within Groups	85.901	319	.269		
	Total	86.007	321			
RESOURCE_MANAGEMENT	Between Groups	.003	2	.002	.007	.993
	Within Groups	75.104	319	.235		
	Total	75.108	321			

An ANOVA test was performed to test the differences between critical thinking and learning strategies across faculties. Findings revealed there were no significant differences between (a) critical thinking (p=.227) (b) cognitive (p=0.458), (c) metacognitive (p=0.822) and (d) resource management (p=0.937) across faculties. The null hypothesis is therefore accepted for research question 2.

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 indicates that the responses are clustered closely around the mean, while a high SD indicates greater variability among the responses.

Findings for Critical Thinking in Learning

This section presents data to answer Research Question 3: What are the levels of critical thinking and learning strategies among undergraduates?

Table 7: Mean (M) and Standard Deviation (SD) for Critical Thinking (5 items)

Item	M	SD
LSCCCTQ1I often find myself questioning things I hear or read in the courses to decide if I find them convincing.	3.80	0.77
LSCCCTQ 2When a theory, interpretation, or conclusion is presented in classes or in the readings, I try to decide if there is good supporting evidence.	3.72	0.76
LSCCCTQ 3I treat the course materials as a starting point and try to develop my own ideas about it.	3.85	0.76
LSCCCTQ 4I try to play around with ideas of my own related to what I am learning in the courses.	3.87	0.70
LSCCCTQ 5Whenever I read or hear an assertion or conclusion in the classes, I think about possible alternatives.	3.72	0.78

As shown in Table 7, the findings indicate a generally high level of critical thinking among undergraduates in learning contexts. The highest mean score was recorded for item LSCCCTQ 4, "I try to play around with ideas of my own related to what I am learning in the courses" (M = 3.87, SD = 0.70), suggesting that learners frequently engage in exploring and developing their own ideas during learning activities. This is closely followed by item LSCCCTQ 3, "I treat the course materials as a starting point and try to develop my own ideas about it" (M = 3.85, SD = 0.76), indicating that learners actively use course materials to generate personal understanding and interpretations. In addition, item LSCCCTQ 1, "I often find myself questioning things I hear or read in the courses to decide if I find them convincing", also recorded a relatively high mean score (M = 3.80, SD = 0.77), reflecting learners' tendency to critically evaluate information presented during learning activities. Meanwhile, the lowest mean scores were observed for item LSCCCTQ 2, "When a theory, interpretation, or conclusion is presented in classes or in the readings, I try to decide if there is good supporting evidence" and item LSCCCTQ 5, "Whenever I read or hear an assertion or conclusion in the classes, I think about possible alternatives" (M = 3.72, SD = 0.76; M = 3.72, SD = 0.78 respectively). These findings suggest that although learners demonstrate positive critical thinking practices overall, they are comparatively less likely to evaluate supporting evidence and consider alternative perspectives during learning activities.

Findings for Cognitive Strategies

This section presents data to answer Research Question 3: What are the levels of critical thinking and learning strategies among undergraduates? In the context of this study, this is measured by (i) Rehearsal, (ii) Organisation, and (iii) Elaboration.

Table 8: Mean (M) and Standard Deviation (SD) for Rehearsal (4 items)

Item	M	SD
LSCCRQ1When I study for the classes, I practice saying the material to myself over and over.	3.69	0.71
LSCCRQ 2When studying for the courses, I read my class notes and the course readings over and over again.	3.67	0.73
LSCCRQ 3I memorise key words to remind me of important concepts in this class.	3.95	0.75
LSCCRQ 4I make lists of important items for the courses and memorise the lists.	3.80	0.76

As presented in Table 8, the findings demonstrate a generally high use of rehearsal strategies among undergraduates in learning contexts. The highest mean score was recorded for item LSCCRQ 3, "I memorise key words to remind me of important concepts in this class" (M = 3.95, SD = 0.75), indicating that learners frequently rely on memorisation of key words to retain important information during learning activities. This is followed by item LSCCRQ 4, "I make lists of important items for the courses and memorise the lists" (M = 3.80, SD = 0.76), suggesting that learners often use listing and memorisation techniques to support their understanding of course materials. In addition, item LSCCRQ 1, "When I study for the classes, I practice saying the material to myself over and over", also recorded a relatively high mean score (M = 3.69, SD = 0.71), reflecting learners' tendency to reinforce understanding through repeated verbal practice. Meanwhile, the lowest mean score was observed for item LSCCRQ 2, "When studying for the courses, I read my class notes and the course readings over and over again" (M = 3.67, SD = 0.73). Although this item recorded the lowest mean within the rehearsal subscale, the findings still indicate that learners moderately to frequently employ repetition-based learning strategies during their academic learning activities.

Table 9: Mean (M) and Standard Deviation (SD) for Organisation (4 items)

Item	M	SD
LSCCOQ1When I study the readings for the courses in the program, I outline the material to help me organise my thoughts.	3.86	0.75
LSCCOQ 2When I study for the courses, I go through the readings and my class notes and try to find the most important ideas.	3.93	0.70
LSCCOQ 3I make simple charts, diagrams, or tables to help me organise course materials in this program.	3.42	0.87
LSCCOQ 4When I study for the courses, I go over my class notes and make an outline of important concepts.	3.75	0.77

As shown in Table 9 above, in terms of organisation, the findings indicate a generally high use of organisation strategies among undergraduates in learning activities. The highest mean score within this sub-scale was recorded for item LSCCOQ 2 "When I study for the courses, I go through the readings and my class notes and try to find the most important ideas" (M = 3.93, SD = 0.70), demonstrating that learners heavily prioritise going through readings and class notes to identify the most critical ideas. This is closely followed by item LSCCOQ 1 " When I study the readings for the courses in the program, I outline the material to help me organise my thoughts" (M = 3.86, SD = 0.75), which indicates that students frequently outline course readings to systematically organise their thoughts. Similarly, item LSCCOQ 4 "When I study for the courses, I go over my class notes and make an outline of important concepts" displayed a high mean score (M = 3.75, SD = 0.77), further reinforcing that undergraduates rely on reviewing class notes to create structured outlines of important concepts. Conversely, the lowest mean score was observed for item LSCCOQ 3 "I make simple charts, diagrams, or tables to help me organise course materials in this program" (M = 3.42, SD = 0.87), suggesting that while students are inclined toward textual outlining and highlighting core ideas, they are comparatively less likely to construct simple charts, diagrams, or tables as a primary method to organise their course materials.

Table 10: Mean (M) and Standard Deviation (SD) for Elaboration (6 items)

Item	M	SD
LSCCEQ1When I study for the courses in this program, I pull together information from different sources, such as lectures, readings, and discussions.	3.84	0.76
LSCCEQ 2I try to relate ideas in one subject to those in other courses whenever possible	3.75	0.73
LSCCEQ 3When reading for the courses, I try to relate the material to what I already know.	3.92	0.76

LSCCEQ 4When I study for the courses in this program, I write brief summaries of the main ideas from the readings and my class notes.	3.71	0.77
LSCCEQ 5I try to understand the material in the classes by making connections between the readings and the concepts from the lectures.	3.85	0.75
LSCCEQ 6I try to apply ideas from course readings in other class activities such as lecture and discussion.	3.81	0.77

In terms of the elaboration strategy dimension, the results in Table 10 demonstrate that the students consistently attempt to integrate new information with existing knowledge frameworks and diverse resources. Item LSCCEQ 3 "When reading for the courses, I try to relate the material to what I already know" recorded the highest mean score (M = 3.92, SD = 0.76), revealing that learners predominantly rely on relating course reading materials to their prior knowledge. This active cognitive processing is further supported by items LSCCEQ 5 "I try to understand the material in the classes by making connections between the readings and the concepts from the lectures" (M = 3.85, SD = 0.75) and LSCCEQ 1 "When I study for the courses in this program, I pull together information from different sources, such as lectures, readings, and discussions" (M = 3.84, SD = 0.76), which show that students frequently synthesise information by making connections between lecture concepts and readings, as well as pulling together data from multiple sources such as lectures, readings, and discussions. Furthermore, undergraduates demonstrated a strong tendency to apply these concepts across contexts, as seen in item LSCCEQ 6 "I try to apply ideas from course readings in other class activities such as lecture and discussion" (M = 3.81, SD = 0.77) and item LSCCEQ 2 "I try to relate ideas in one subject to those in other courses whenever possible" (M = 3.75, SD = 0.73), reflecting their efforts to apply course ideas to other class activities and relate concepts from one subject to other courses whenever possible. Finally, item LSCCEQ 4 "When I study for the courses in this program, I write brief summaries of the main ideas from the readings and my class notes" received the lowest mean score within this dimension (M = 3.71, SD = 0.77), indicating that while still widely practiced, writing brief summaries of main ideas from readings and notes is slightly less favoured compared to making direct cognitive connections and cross-referencing information.

Findings for Metacognitive Strategies

This section presents data to answer Research Question 3: What are the levels of critical thinking and learning strategies among undergraduates?

Table 11: Mean (M) and Standard Deviation (SD) for Metacognitive Self-Regulation (11 items)

Item	M	SD
MSSRQ1During class time, I often miss important points because I am thinking of other things.	3.02	1.01
MSSRQ 2When reading for the courses, I make up questions to help focus my reading.	3.46	0.84
MSSRQ 3When I become confused about something I am reading for the classes, I go back and try to figure it out.	3.81	0.81
MSSRQ 4If course readings are difficult to understand, I change the way I read the material.	3.79	0.81
MSSRQ 5Before I study new course material thoroughly, I often skim it to see how it is organized	3.54	0.77
MSSRQ 6I ask myself questions to make sure I understand the material I have been studying in this program.	3.82	0.77
MSSRQ7I try to change the way I study in order to fit any course requirements and the instructors' teaching style.	3.70	0.71

MSSRQ8I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for the courses in this program.	3.71	0.68
MSSRQ 9When studying for the courses in this program I try to determine which concepts I do not understand well.	3.81	0.71
MSSRQ 10When I study for the courses, I set goals for myself in order to direct my activities in each study period.	3.72	0.82
MSSRQ 11If I get confused taking notes in classes, I make sure I sort it out afterwards.	3.77	0.77

As presented in Table 11, the findings indicate a generally high level of metacognitive self-regulation among undergraduates in their learning activities. The highest mean score was recorded for item MSSRQ 6, "I ask myself questions to make sure I understand the material I have been studying in this program" (M = 3.82, SD = 0.77), suggesting that learners actively monitor their understanding during learning processes. This is closely followed by items MSSRQ 3, "When I become confused about something I am reading for the classes, I go back and try to figure it out" and MSSRQ 9, "When studying for the courses in this program I try to determine which concepts I do not understand well" (M = 3.81, SD = 0.81; M = 3.81, SD = 0.71 respectively), indicating that learners frequently reflect on and regulate their understanding when encountering difficulties during learning activities. In addition, item MSSRQ 4, "If course readings are difficult to understand, I change the way I read the material", also recorded a relatively high mean score (M = 3.79, SD = 0.81), reflecting learners' tendency to adapt their learning strategies according to different learning situations. Meanwhile, the lowest mean score was observed for item MSSRQ 1, "During class time, I often miss important points because I am thinking of other things" (M = 3.02, SD = 1.01). Despite being the lowest-scoring item in the subscale, the result still indicates a moderate level of agreement and may suggest that some students occasionally experience difficulties maintaining focus during classroom learning activities. Overall, the findings suggest that the respondents possess relatively strong metacognitive self-regulation skills, particularly in terms of monitoring comprehension, identifying learning difficulties, and adapting learning strategies to support academic understanding.

Findings for Resource Management

This section presents data to answer Research Question 3: What are the levels of critical thinking and learning strategies among undergraduates? In the context of this study, this is measured by (i) environment management, (ii) effort management, and (iii) help-seeking.

(i) Table 12: Mean (M) and Standard Deviation (SD) for Environment Management (5 items)

Item	M	SD
RMCEMQ1I usually study in a place where I can concentrate on my course work.	4.07	0.76
RMCEMQ 2I make good use of my study time for the courses in this program.	3.84	0.74
RMCEMQ3I have a regular place set aside for studying	3.87	0.77
RMCEMQ 4I make sure that I keep up with the weekly readings and assignments for the courses.	4.43	0.71
RMCEMQ 5I attend the classes regularly in this program.	3.63	0.85

As shown in Table 12, the findings indicate a high level of environmental management strategies among undergraduates in their learning activities. The highest mean score was recorded for item RMCEMQ 4, "I make sure that I keep up with the weekly readings and assignments for the courses" (M = 4.43, SD = 0.71), suggesting that learners are highly committed to managing their academic responsibilities consistently throughout the semester. This is followed by item RMCEMQ 1, "I usually study in a place where I can concentrate on my coursework" (M = 4.07, SD = 0.76), indicating that learners tend to select suitable learning environments that support concentration during study sessions. In addition, item RMCEMQ 3, "I have a regular place set aside for studying", also recorded a relatively high mean score (M = 3.87, SD = 0.77), reflecting learners' tendency to

maintain organised study routines and environments. Meanwhile, the lowest mean score was observed for item RMCEMQ 5, "I attend the classes regularly in this program" (M = 3.63, SD = 0.85). Although this item recorded the lowest mean within the environment management subscale, the findings still suggest that learners generally demonstrate positive environment management practices to support their academic learning activities.

(ii) Table 13: Mean (M) and Standard Deviation (SD) for Effort Management (4 items)

Item	M	SD
RMCEMQ1I have a regular place set aside for studying	3.63	0.85
RMCEMQ 2I work hard to do well in the classes in this program even if I do not like what we are doing.	3.94	0.77
RMCEMQ 3When course work is difficult, I either give up or only study the easy parts.	2.79	1.15
RMCEMQ 4Even when course materials are dull and uninteresting, I manage to keep working until I finish.	4.07	0.70

As presented in Table 13, the findings indicate a generally positive level of effort management among undergraduates in their learning activities. The highest mean score was recorded for item RMCEMQ 4, "Even when course materials are dull and uninteresting, I manage to keep working until I finish" (M = 4.07, SD = 0.70), suggesting that learners demonstrate persistence and commitment in completing academic tasks despite challenges or lack of interest. This is followed by item RMCEMQ 2, "I work hard to do well in the classes in this program even if I do not like what we are doing" (M = 3.94, SD = 0.77), indicating that learners are generally motivated to maintain effort in their studies regardless of personal preference towards the learning activities. In addition, item RMCEMQ 1, "I have a regular place set aside for studying", recorded a moderate to high mean score (M = 3.63, SD = 0.85), reflecting learners' tendency to maintain consistent study routines. Meanwhile, the lowest mean score was observed for item RMCEMQ 3, "When coursework is difficult, I either give up or only study the easy parts" (M = 2.79, SD = 1.15). This finding suggests that learners are generally less likely to avoid challenging academic tasks, indicating positive effort management practices among undergraduates during learning activities.

(iii) Table 14: Mean (M) and Standard Deviation (SD) for Help-Seeking (2 items)

Item	M	SD
RMCHSQ1When I cannot understand the material in a course, I ask my lecturer for help.	3.88	0.87
RMCHSQ 2 When I cannot understand the material in a course, I ask another student in the class for help.	4.21	0.71
RMCHSQ 3 When I cannot understand the material in a course, I ask my friends from other class for help.	3.75	1.03
RMCHSQ 4 When I cannot understand the material in a course, I ask my seniors who have taken the course previously for help.	3.07	1.25

As shown in Table 14, the findings indicate that undergraduates generally demonstrate positive help-seeking behaviours when encountering difficulties in understanding course materials. The highest mean score was recorded for item RMCHSQ 2, "When I cannot understand the material in a course, I ask another student in the class for help" (M = 4.21, SD = 0.71), suggesting that learners are highly inclined to seek assistance from their classmates during learning activities. This is followed by item RMCHSQ 1, "When I cannot understand the material in a course, I ask my lecturer for help" (M = 3.88, SD = 0.87), indicating that learners are also comfortable approaching lecturers for academic guidance when necessary. In addition, item RMCHSQ 3, "When I cannot understand the material in a course, I ask my friends from other class for help" recorded a relatively

high mean score (M = 3.75, SD = 1.03), reflecting learners' willingness to extend their support networks beyond their immediate classroom environment. Meanwhile, the lowest mean score was observed for item RMCHSQ 4, "When I cannot understand the material in a course, I ask my seniors who have taken the course previously for help" (M = 3.07, SD = 1.25). Although this item recorded the lowest mean within the help-seeking subscale, the findings still suggest that learners moderately employ various help-seeking strategies to support their learning processes.

Exploratory Statistics

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.

Findings for the Relationship between Critical Thinking and Learning Strategies

This section presents data to answer Research Question 4: Is there a significant relationship between critical thinking and learning strategies among undergraduates?

$H_{01:}$ There is no significant relationship between critical thinking and learning strategies

To determine if there is a significant association in the mean scores between critical thinking and learning strategies data is analysed using SPSS for correlations. Results are presented separately in Table 15 below.

Table 15: Correlation between Critical Thinking and Learning Strategies

		Cognitive	Metacognitive	Resource Management
Critical Thinking	Pearson (Correlation	.714**	.669**	.597**
	Sig (2-tailed)	<.001	<.001	<.001
	N	322	322	322

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

Table 15 shows there is an association between critical thinking and cognitive, metacognitive and resource management. According to He (2024), the coefficient is significant at the .05 level, and a positive correlation is measured on a 0.1 to 1.0 scale. 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.

Critical Thinking and Cognitive Factors

Correlation analysis shows that there is a high significant association between critical thinking and cognitive factors (r=.714**) and (p=.<.001). This means that there is also a strong positive relationship between critical thinking and cognitive factors.

Critical Thinking and Metacognitive Factors

Correlation analysis shows that there is a high significant association between critical thinking and metacognitive factors (r=.669**) and (p=.<.001). This means that there is also a strong positive relationship between critical thinking and metacognitive factors.

Critical Thinking and Resource Management Factors

Correlation analysis shows that there is a high significant association between critical thinking and resource

management (r=.597**) and (p=.<.001). This means that there is also a strong positive relationship between critical thinking and resource management.

CONCLUSION

Summary of Findings and Discussions

This study explored the relationship between learning strategies and critical thinking among undergraduates. The findings revealed that learners generally demonstrated positive perceptions towards the use of critical thinking, cognitive strategies, metacognitive strategies, and resource management strategies in learning activities. In terms of critical thinking, the findings showed that learners frequently engaged in generating their own ideas, questioning information, and reflecting on learning materials during academic learning processes. These findings are in accordance with the study by Abrami et al. (2015), which reported that active learning environments encourage learners to engage in higher-order thinking skills such as analysing, evaluating, and reflecting on information critically. Similarly, Tiruneh et al. (2017) also found that learners exposed to reflective and problem-solving learning environments demonstrated stronger critical thinking abilities.

For cognitive strategies, the findings indicated that learners frequently employed rehearsal, organisation, and elaboration strategies during learning activities. Learners were found to rely heavily on identifying important ideas, relating new knowledge to prior knowledge, and organising information to support understanding. These findings are consistent with the study by Rahmat (2021), which revealed that learners actively employed cognitive and metacognitive strategies when engaging in reading, thinking, and writing tasks. In addition, Teng (2022) also highlighted that learners who actively regulate and organise their learning processes are more capable of engaging critically and independently in learning activities.

In terms of metacognitive strategies, the findings demonstrated that learners actively monitored, evaluated, and adjusted their learning processes when encountering difficulties during academic tasks. Learners were also found to reflect on their understanding and modify their learning approaches according to learning situations. These findings support the framework by Pintrich et al. (1991), which emphasises that metacognitive self-regulation enables learners to plan, monitor, and regulate their learning behaviours effectively. Similarly, Zimmerman (2002) also stated that self-regulated learners are more capable of controlling and adapting their learning strategies according to academic demands and learning goals.

Furthermore, the findings on resource management strategies revealed that learners demonstrated positive environment management, effort management, and help-seeking behaviours during learning activities. Learners were found to manage their study environments effectively, maintain effort in completing academic tasks, and seek assistance from peers and lecturers when necessary. These findings are aligned with the study by Teng (2022), which reported that learners who employ self-regulated learning strategies are more likely to demonstrate positive learning behaviours and actively engage in academic learning processes.

The inferential findings further revealed that there were no significant differences in critical thinking and learning strategies across faculties and SPM English achievement backgrounds. This suggests that learners from different academic backgrounds generally demonstrated similar patterns in their use of learning strategies and critical thinking practices. More importantly, correlation analysis revealed significant positive relationships between critical thinking and all three learning strategy dimensions, namely cognitive strategies, metacognitive strategies, and resource management strategies. The strong relationship between critical thinking and cognitive strategies may be explained by the fact that both constructs require learners to actively process information rather than engage in passive memorisation. Learners who critically analyse, evaluate, and synthesise information are more likely to employ cognitive strategies such as elaboration, organisation, and integration of knowledge to facilitate understanding. Similarly, the positive relationship between critical thinking and metacognitive strategies suggests that learners who think critically are more likely to monitor, evaluate, and regulate their own learning processes. From a self-regulated learning perspective, critical thinking requires learners to reflect on their understanding, identify knowledge gaps, and make informed decisions about appropriate learning approaches. Such reflective practices are closely aligned with metacognitive self-regulation processes described by Pintrich et al. (1991) and Zimmerman (2002). The positive association between critical thinking and resource

management strategies may also indicate that learners who engage in higher-order thinking are more proactive in managing learning environments, sustaining effort, and seeking assistance when needed. Critical thinkers are likely to recognise the importance of utilising available resources effectively to support learning goals and overcome academic challenges. Overall, these findings suggest that critical thinking functions as an important component of self-regulated learning. Learners who demonstrate stronger critical thinking tendencies are more likely to employ a range of learning strategies that enable them to plan, monitor, regulate, and support their own learning processes effectively.

An important consideration when interpreting the findings is the conceptual proximity between critical thinking and cognitive learning strategies. Although critical thinking was analysed as a separate construct in this study, it is also represented as a subcomponent within the cognitive strategy framework proposed by Pintrich et al. (1991). Consequently, some degree of overlap may exist between the constructs, which could partly explain the relatively strong relationship observed between critical thinking and cognitive strategies. Nevertheless, this study conceptualises critical thinking as a broader higher-order thinking process involving analysis, evaluation, and reflective judgement (Facione, 1990), whereas cognitive strategies refer to the specific learning behaviours and techniques learners employ during academic tasks. Future studies may further examine these constructs using alternative measurement models to establish clearer conceptual distinctions and strengthen construct validity.

IMPLICATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

Theoretical and Conceptual Implications

The findings of this study provide support for the theoretical framework and conceptual framework employed in this research. The positive relationship between critical thinking and learning strategies suggests that learners who demonstrate stronger critical thinking tendencies are more likely to employ cognitive, metacognitive, and resource management strategies actively during learning activities. These findings support the framework by Pintrich et al. (1991), which emphasises the importance of self-regulated learning strategies in managing academic learning processes effectively. In addition, the findings also support Facione's (1990) perspective that critical thinking involves reflective and analytical processes that contribute to effective learning and problem-solving. The findings further strengthen the conceptual understanding that critical thinking and learning strategies are closely interconnected in higher education learning contexts. The findings may also be interpreted through the lens of Self-Regulated Learning (SRL) theory. SRL emphasises learners' active role in planning, monitoring, evaluating, and regulating their learning behaviours to achieve academic goals. The significant relationships observed between critical thinking and the three learning strategy dimensions suggest that critical thinking may function as a supporting mechanism that facilitates self-regulated learning. Learners who engage in critical reflection and analytical thinking are more likely to select appropriate learning strategies, monitor their progress, and utilise available resources effectively. Therefore, the findings extend current understanding of how critical thinking and learning strategies operate together within self-regulated learning processes in higher education contexts.

Pedagogical Implications

The findings of this study suggest several important pedagogical implications for higher education learning environments. Since learners were found to demonstrate positive use of cognitive, metacognitive, and resource management strategies, educators should continue to encourage learning environments that promote active learning, reflection, and independent thinking among students. Teaching approaches such as problem-solving activities, collaborative learning, reflective discussions, and inquiry-based learning may help strengthen learners' critical thinking and self-regulated learning abilities. In addition, lecturers should provide opportunities for learners to evaluate information critically, question ideas, and reflect on their own learning processes during classroom activities.

The findings also suggest that learners benefit from peer interaction and help-seeking behaviours during learning activities. Therefore, educators should encourage supportive classroom environments that promote collaboration, discussion, and academic support among learners. Overall, the integration of critical thinking

activities and learning strategies into classroom instruction may contribute to more meaningful and effective learning experiences among undergraduates.

Suggestions for Future Research

Several suggestions can be proposed for future research based on the findings of this study. First, future studies should employ more representative sampling techniques involving participants from multiple universities, academic disciplines, and demographic backgrounds. Expanding the sampling frame would improve the generalisability of the findings and allow meaningful comparisons across different educational contexts. Such investigations may provide a broader understanding of how critical thinking and learning strategies operate among diverse undergraduate populations. In addition, future researchers may employ mixed-method or qualitative approaches to gain deeper insights into learners' experiences, perceptions, and challenges in applying learning strategies during academic learning activities. Future studies may also examine other variables related to learning strategies and critical thinking, such as academic motivation, learning anxiety, academic achievement, or digital learning environments. Furthermore, longitudinal studies may be conducted to examine how learners' critical thinking and learning strategies develop over time throughout their higher education experiences. In addition, although the instrument demonstrated strong reliability, future studies should examine construct validity through Exploratory Factor Analysis (EFA) or Confirmatory Factor Analysis (CFA) to provide additional evidence regarding the underlying factor structure and discriminant validity of the constructs. These future investigations may contribute to a deeper understanding of the role of critical thinking and learning strategies in higher education learning contexts.

REFERENCES

1. Abrami, P. C., Bernard, R. M., Borokhovski, E., Waddington, D. I., Wade, C. A., & Persson,T. (2015). Strategies for teaching students to think critically: A meta-analysis. Review of Educational Research, 85(2), 275–314. https://doi.org/10.3102/0034654314551063
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.
3. Facione, P. A. (1990). Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction. The Delphi Report. American Philosophical Association.
4. He, L. (2024) The Application of SPSS Correlation Analysis in the Study of Precision Teaching of English in Universities. Applied Mathematics and Nonlinear Science, 9(1), 1-13. http://dx.doi.org/10.2478/amns-2024-1371
5. Oxford, R. L. (1990). Language learning strategies: What every teacher should know. New
6. York, NY: Newbury House.
7. Pintrich, P. R., Smith, D. A. F., Garcia, T., & McKeachie, W. J. (1991). A manual for the use
8. of the Motivated Strategies for Learning Questionnaire (MSLQ). University of Michigan.
9. 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/IJARBSS/v11-i3/8919
10. Rahmat, N.H., Arepin, M., & Sulaiman, S. (2020). The Cycle of Academic Reading Fear among Undergraduates. Asian Journal of University Education (AJUE), 16(3), 265-274. https://doi.org/10.24191/ajue.v16i3.9730
11. Shen, X., & Teng, L.S. (2025). Unveiling the effect of self-regulated learning strategies on learning engagement among Chinese EFL learners in the online learning environment. Digital Applied Linguistics, 3, 102473-102473.
12. Teng, M.F. (2022). Self-regulated learning and second language learning: Strategies, motivation, and individual differences. The Asia-Pacific Education Researcher, 31(6), 615–623.
13. Tiruneh, D. T., Verburgh, A., & Elen, J. (2017). Effectiveness of critical thinking instruction in higher education: A systematic review of intervention studies. Higher Education Studies, 7(1), 1–17.
14. 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, 12595), 1797-1802. https://doi.org/10.1213/ane.0000000000002471
15. Wenden A and Rubin J (1987) Learner Strategies in Language Learning. New Jersey: Prentice Hall.

16. Ziegenfuss, J. Y., Casey A. E., Jennifer M. D., Meghan M. J., Thomas E. K, and Marna, C. (2021) 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.
17. Zimmerman, B.J. (2002). Becoming a self-regulated learner: An overview. Theory Into Practice, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2

APPENDIX

LEARNING STRATEGIES IN LANGUAGE LEARNING (This instrument is adapted from Wenden and Rubin, 1987)LEARNING STRATEGIES (42 items)

	VARIABLE (KEYWORD)		CONSTRUCT	ITEM/ INDICATOR	TO ITEM
A	COGNITIVE COMPONENTS	(i)	Rehearsal	4	14
		(ii)	Organization	4	
		(iii)	Elaboration	6	
		(iv)	Critical Thinking	5	5
B	METACOGNITIVE SELF-REGULATION				11
C	RESOURCE MANAGEMENT	(i)	Environment Management	4	12
		(ii)	Effort Management	4	
		(iii)	Help-Seeking	4	
					42

LEARNING STRATEGIES COGNITIVE COMPONENTS (19 items)(i) Rehearsal (4 items)

NO	ITEM
1	LSCCRQ1When I study for the classes, I practice saying the material to myself over and over.
2	LSCCRQ 2When studying for the courses, I read my class notes and the course readings over and over again.
3	LSCCRQ 3I memorize key words to remind me of important concepts in this class.
4	LSCCRQ 4I make lists of important items for the courses and memorize the lists.

(ii) Organization (4 items)

NO	ITEM
1	LSCCOQ1When I study the readings for the courses in the program, I outline the material to help me organize my thoughts.
2	LSCCOQ 2When I study for the courses, I go through the readings and my class notes and try to find the most important ideas.
3	LSCCOQ 3I make simple charts, diagrams, or tables to help me organize course materials in this program.
4	LSCCOQ 4When I study for the courses, I go over my class notes and make an outline of important concepts.

(iii) Elaboration (6 items)

NO	ITEM
1	LSCCEQ1When I study for the courses in this program, I pull together information from different sources, such as lectures, readings, and discussions.
2	LSCCEQ 2I try to relate ideas in one subject to those in other courses whenever possible
3	LSCCEQ 3When reading for the courses, I try to relate the material to what I already know.
4	LSCCEQ 4When I study for the courses in this program, I write brief summaries of the main ideas from the readings and my class notes.
5	LSCCEQ 5I try to understand the material in the classes by making connections between the readings and the concepts from the lectures.
6	LSCCEQ 6I try to apply ideas from course readings in other class activities such as lecture and discussion.

(iv) Critical Thinking (5 items)

NO	ITEM
1	LSCCCTQ1I often find myself questioning things I hear or read in the courses to decide if I find them convincing.
2	LSCCCTQ 2When a theory, interpretation, or conclusion is presented in classes or in the readings, I try to decide if there is good supporting evidence.
3	LSCCCTQ 3I treat the course materials as a starting point and try to develop my own ideas about it.
4	LSCCCTQ 4I try to play around with ideas of my own related to what I am learning in the courses.
5	LSCCCTQ 5Whenever I read or hear an assertion or conclusion in the classes, I think about possible alternatives.

A. Metacognitive Self-Regulation (11 items)

NO	ITEM
1	MSSRQ1During class time, I often miss important points because I am thinking of other things.
2	MSSRQ 2When reading for the courses, I make up questions to help focus my reading.
3	MSSRQ 3When I become confused about something I am reading for the classes, I go back and try to figure it out.
4	MSSRQ 4If course readings are difficult to understand, I change the way I read the material.
5	MSSRQ 5Before I study new course material thoroughly, I often skim it to see how it is organized
6	MSSRQ 6I ask myself questions to make sure I understand the material I have been studying in this program.
7	MSSRQ7I try to change the way I study in order to fit any course requirements and the instructors' teaching style.
8	MSSRQ8I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying for the courses in this program.
9	MSSRQ 9When studying for the courses in this program I try to determine which concepts I do not understand well.
10	MSSRQ 10When I study for the courses, I set goals for myself in order to direct my activities in each study period.
11	MSSRQ 11If I get confused taking notes in classes, I make sure I sort it out afterwards.

C. RESOURCE MANAGEMENT COMPONENT (11 items)

(i) Environment Management (5 items)

NO	ITEM
1	RMCEMQ1I usually study in a place where I can concentrate on my course work.
2	RMCEMQ 2I make good use of my study time for the courses in this program.
3	RMCEMQ3I have a regular place set aside for studying
4	RMCEMQ 4Imake sure that I keep up with the weekly readings and assignments for the courses.
5	RMCEMQ 5I attend the classes regularly in this program.

(ii) Effort Management (4 items)

NO	ITEM
1	RMCEMQ1I have a regular place set aside for studying
2	RMCEMQ 2I work hard to do well in the classes in this program even if I do not like what we are doing.
3	RMCEMQ 3When course work is difficult, I either give up or only study the easy parts.
4	RMCEMQ 4Even when course materials are dull and uninteresting, I manage to keep working until I finish.

(iii) Help-Seeking (2 items)

NO	ITEM
59	RMCHSQ1When I cannot understand the material in a course, I ask my lecturer for help.
66	RMCHSQ 2 When I cannot understand the material in a course, I ask another student in the class for help.
67	RMCHSQ 3 When I cannot understand the material in a course, I ask my friends from other class for help.
69	RMCHSQ 4 When I cannot understand the material in a course, I ask my seniors who have taken the course previously for help.