

Environment Management and Self-Regulated Learning Strategies Among Higher Education Students in Malaysia

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ABSTRACT

Learning strategies help students take greater responsibility for their own learning and are commonly divided into cognitive, metacognitive, and resource management components. Within resource management, environment management is rarely studied as a distinct construct. This study explores the relationship between environment management and cognitive, metacognitive, and resource management components, and whether this differs across gender and academic cluster. This quantitative survey used a 5-point Likert-scale instrument rooted in Wenden and Rubin (1987). The instrument had four sections: demographic profile, cognitive components (19 items), metacognitive self-regulation (11 items), and resource management (12 items), with a Cronbach's alpha of .959. A total of 238 respondents from public and private higher education institutions in Johor, Malaysia took part in the survey. Findings show no significant difference in learning strategy use across gender and academic cluster, and learners reported positive practices across all components, with environment management strongly correlated with the other three. These findings support Bandura's Social Cognitive Theory and Zimmerman's Self-Regulated Learning Theory, and suggest that educators should embed environment management guidance into teaching.

Keywords: Environment Management; Cognitive Strategies; Metacognitive Strategies; Resource Management; Self-Regulated Learning

INTRODUCTION

Background of Study

Learning strategies have become increasingly important in higher education as students are expected to assume bigger responsibility for their own learning. Students are required to control their thoughts, attitude, and learning styles to achieve academic success rather than just acquire the knowledge. This expectation is consistent with Bandura's (1986) Social Cognitive Theory, which stated that learning is shaped through the reciprocal interaction of personal factors, behaviours, and environmental influences. From this perspective, students are not passive recipients of knowledge but active participants who influence and regulate their own learning experiences.

Followed Bandura's theoretical framework, Zimmerman (2000) introduced the concept of self-regulated learning (SRL), which explains how learners carefully plan and evaluate their learning style to achieve the specific goals. Self-regulated learners actively employ appropriate learning strategies, monitor their progress, and modify their approaches when necessary. Learning strategies are considered essential components of successful self-regulated learning, enabling students to become more independent, motivated, and effective learners.

Under the self-regulated learning framework, learning strategies are divided into three components; cognitive, metacognitive, and resource management. Cognitive strategies handle information processing through rehearsal, organization, and elaboration, while metacognitive strategies allow students to actively plan, monitor, and evaluate their own progress. On the other hand, resource management strategies focus on optimizing the external conditions for study, such as controlling time, effort, the environment, and help-seeking behaviours. Together, these elements empower learners to manage both their internal cognitive processes and the external environments that drive academic success.

Among the resource management strategies, environmental management has become increasingly relevant in contemporary higher education. As learning environments continue to evolve through online, blended, and technology-supported instruction, students are expected to create and maintain learning spaces that minimise distractions and support concentration. Effective environment management enables learners to optimise the use of cognitive and metacognitive strategies, whereas ineffective management of the learning environment may hinder learning engagement and academic performance. The increasing presence of digital technologies and self-directed learning further highlights the importance of understanding how students manage their learning environments to support successful learning.

Statement of Problem

Recent studies on language learning strategies among Malaysian university students disagree on which self-regulated learning component predominates. Rahim et al. (2024) found cognitive strategies most used, Raffi et al. (2023) found metacognitive strategies most used, and Neo et al. (2024) and Fakhruddin et al. (2024) found resource management strategies most used, while Chong et al. (2025) found environmental factors the strongest influence on language learners in Thailand and Vietnam. These inconsistencies suggest that the relationship between environment management and other self-regulated learning components varies by context and warrants further study. Moreover, environment management is rarely investigated as a distinct construct. Most studies, including Rasdi et al. (2025), treat it merely as one sub-component nested within the broader resource management strategy, alongside effort management and help-seeking (Wenden & Rubin, 1987), even though Beckers et al. (2016) and Noor Saad and Md Yunus (2015) show the physical learning space itself significantly shapes student engagement.

Existing studies also seldom examine whether environment management, and its influence on other learning strategy components, differs by learners' gender or academic cluster. Rasdi et al. (2025), whose study used the same theoretical framework adopted here, explicitly recommended that future researchers examine such differences between male and female students. This gap, together with the inconsistent findings above and the limited treatment of environment management as an independent construct, motivates the present study, which isolates environment management and examines its relationship with cognitive components, metacognitive components, and resource management, as well as its variation across gender and academic cluster among Malaysian university students.

Objective of the Study and Research Questions

This study is done to explore the relationship between environment management and learning. Specifically, this study is done to answer the following questions:

1. Are there significant differences in learning strategies across gender and cluster?
 - H_{01} : There is no significant difference in learning strategies across gender and cluster.
2. How do learners perceive environment management in learning?
3. How do learners perceive cognitive components in learning?
4. How do learners perceive metacognitive components in learning?
5. How do learners perceive resource management in learning?
6. Is there a relationship between environmental management and cognitive components?
 - H_{02} : There is no significant relationship between environmental management and cognitive components.
7. Is there a relationship between environmental management and metacognitive components?

- H_{03} : There is no significant relationship between environmental management and metacognitive components.
- 8. Is there a relationship between environmental management and resource management?
 - H_{04} : There is no significant relationship between environmental management and resource management.

LITERATURE REVIEW

Theoretical Framework of the Study

Social Cognitive theory

Bandura's Social Cognitive Theory (2012) explains human learning as a dynamic process that occurs through the reciprocal interaction of personal factors, behaviour, and environmental influences, a concept known as reciprocal determinism. According to Bandura (2012), individuals learn not only through direct experience but also by observing others, evaluating the consequences of actions, and developing beliefs about their own capabilities, referred to as self-efficacy. This theory is highly relevant to how students manage their learning environment, as students' study-space and study-habit behaviours can be shaped through observation of peers, social modelling by instructors, and institutional norms around structured study. For example, students are more likely to adopt effective environment-management practices, such as maintaining a dedicated study space or minimising distractions, when they observe peers and instructors modelling these behaviours and when they experience the resulting improvements in concentration and academic performance. In the context of language learning strategies specifically, Social Cognitive Theory highlights the importance of learners' self-regulation, motivation, and confidence in their ability to acquire a language. Learners who observe successful language users, employ effective learning strategies, and receive positive feedback are more likely to develop strong self-efficacy and persist in overcoming language-learning challenges. Thus, the theory provides a valuable framework for understanding both how students regulate their learning environment and how they engage in strategic language learning.

Self-Regulated Learning theory (Zimmerman, 2020)

Zimmerman's Self-Regulated Learning (SRL) Theory (2020) conceptualizes learning as an active, cyclical process in which learners proactively set goals, monitor their progress, regulate their behaviours, and reflect on learning outcomes. The theory emphasizes that successful learners are not passive recipients of information but active participants who strategically manage their cognitive, metacognitive, motivational, and environmental resources to achieve academic goals. In relation to learning strategies, SRL highlights the importance of cognitive components such as rehearsal, elaboration, organization, and critical thinking, which help learners process and retain information effectively.

The theory also underscores metacognitive self-regulation, involving planning, monitoring, and evaluating one's learning processes to ensure that learning objectives are met efficiently. Furthermore, resource management strategies, including time management, effort regulation, help-seeking, and the management of learning environments, enable learners to optimize the conditions necessary for successful learning. Through these interconnected processes, learners develop greater autonomy, motivation, and academic performance. Therefore, Zimmerman's (2020) Self-Regulated Learning Theory provides a comprehensive framework for understanding how cognitive strategies, metacognitive regulation, and effective resource management contribute to successful and Lifelong Learning.

Past Studies

Past Studies on Language Learning Strategies

Many studies have been done to investigate the components of self-regulated learning strategies used by learners, particularly cognitive, metacognitive, and resource management strategies, across different educational and cultural settings. The study by Chong et al. (2025) was done to investigate the influence of environmental, personal, and behavioural factors on language learning strategies among university students

studying Mandarin in Thailand and Vietnam. A purposive sample of 421 students completed a 41-item Likert-scale questionnaire covering cognitive, metacognitive, and resource management strategies. The findings revealed that environmental factors, specifically resource management strategies, exerted the strongest influence on learners' strategy use, followed by personal factors, implying that institutions should design conducive and well-structured learning environments to strengthen learners' cognitive and metacognitive engagement.

Next, the study by Rasdi et al. (2025) also looked at how cognitive, resource management, and metacognitive self-regulation strategies are used among undergraduates at a Malaysian public university. A total of 125 students from UiTM Cawangan Johor responded to a 42-item Likert-scale survey rooted in Wenden and Rubin (1987). The study found that resource management strategies, particularly regular class attendance and studying in a conducive environment, recorded the highest mean scores, and that resource management was strongly and significantly correlated with both cognitive strategies ($r = .697$) and metacognitive self-regulation ($r = .736$). The implication drawn was that strengthening students' resource management, especially their study environment, could indirectly enhance their cognitive and metacognitive engagement.

The study by Chanderan and Hashim (2022) was done to investigate the language learning strategies employed by ESL undergraduate students and the factors that influence their use. Using the Strategy Inventory for Language Learning (SILL), the researchers surveyed 200 freshmen, comprising 119 female and 81 male students, from five faculties at a private university in Selangor, Malaysia. The findings showed that metacognitive and social strategies were the most preferred strategies among the respondents, while memory and affective strategies were the least used, implying that ESL learners in the Malaysian context rely more on planning and monitoring their learning than on memorisation techniques.

Next, the study by Tadesse et al. (2022) also looked at self-regulated learning strategies, but among 1,142 undergraduate students majoring in Business and Economics, and Engineering and Technology, across three public universities in Ethiopia. Using a contextually modified questionnaire derived from the Motivated Strategies for Learning Questionnaire (MSLQ) and structural equation modelling, the study measured metacognition, time and study management, effort regulation, peer learning, and help-seeking. The findings indicated that help-seeking was the most significant predictor of students' perceived learning gains, followed by peer learning and time and study management, implying that resource management components play a central role in determining students' overall learning outcomes, even outside of a language-learning context.

Taken together, the studies reviewed above show that learners across different countries and disciplines consistently rely on a combination of cognitive, metacognitive, and resource management strategies to support their learning, although the dominant strategy component differs depending on context, population, and instrument used. What is common across these studies, however, is that researchers investigating environment- and resource-related components (Chong et al., 2025; Rasdi et al., 2025; Tadesse et al., 2022) consistently link these components to stronger cognitive and metacognitive engagement, reinforcing the assumption that a well-managed learning environment functions as an active driver of self-regulated learning rather than merely a background condition. They said resource- and environment-related strategies matter for cognitive and metacognitive engagement. This study asks specifically how environment management, examined as its own construct rather than folded into resource management as a whole, relates to cognitive components, metacognitive components, and resource management among Malaysian university students, and whether this relationship differs across gender and academic cluster.

Conceptual Framework of the Study

Figure 1 shows the conceptual framework of the study. This framework conceptualises environment management as a self-regulatory mechanism that is associated with how learners engage cognitively, metacognitively, and strategically with learning tasks. Learners differ in how they approach language learning and therefore rely on different strategies to optimise their learning environments, including physical, social, and instructional contexts (Rahmat et al., 2021). Grounded in Social Cognitive Theory, learning is explained as a reciprocal interaction between personal factors, behaviours, and environmental conditions, where learners actively regulate their surroundings to sustain motivation and performance (Bandura, 2012). This perspective

aligns with resource management components such as effort management and help-seeking, as learners strategically adjust environmental conditions and seek social resources to overcome learning challenges. The framework further integrates Self-Regulated Learning Theory, which positions cognitive and metacognitive control as central to effective learning through planning, monitoring, and evaluation (Zimmerman, 2020). These processes correspond to the cognitive (strategy use) and metacognitive components (self-monitoring and regulation), which are strengthened when learners manage distractions and structure supportive environments. Collectively, the framework outlines how environment management is expected to be associated with cognitive engagement, metacognitive awareness, and effective resource management, and, by extension, with adaptive and strategic learning behaviour more broadly.

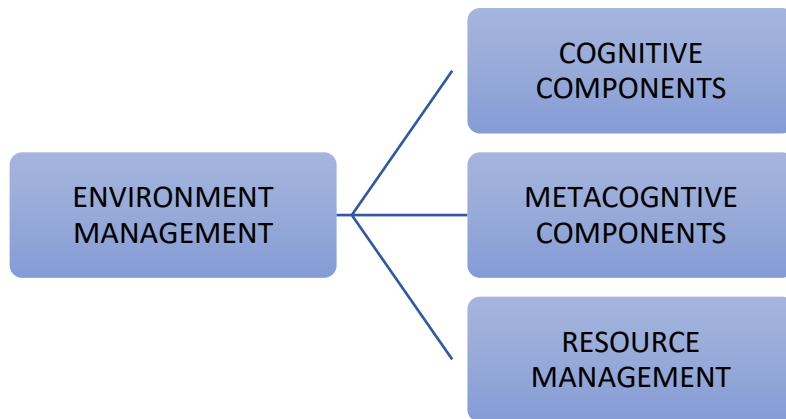


Figure 1: Conceptual Framework of the Study- Environment Management and Self-Regulated Learning Strategies Among Higher Education Students in Malaysia

METHODOLOGY

This study employed a quantitative, descriptive survey design to examine the relationship between environment management and learners' cognitive, metacognitive, and resource management strategies. A convenience sample of 238 students from public and private universities in Johor, Malaysia participated in the survey. Data were collected using a Google Form questionnaire on a 5-point Likert scale adapted from Wenden and Rubin (1987), covering the variables presented in Table 2 below. Table 1 below shows the categories used for the Likert scale: 1 represents Strongly Disagree, 2 represents Disagree, 3 represents Neutral, 4 represents Agree, and 5 represents Strongly Agree.

Table 1: Likert Scale Use

1	Strongly Disagree
2	Disagree
3	Neutral
4	Agree
5	Strongly Agree

Table 2: Distribution of Items in the Survey

	VARIABLE (KEYWORD)		CONSTRUCT	ITEM/ INDICAT OR	TO ITEM

A	COGNITIVE COMPONENTS	(a)	Rehearsal	4	19(.942)
		(b)	Organization	4	
		(c)	Elaboration	6	
		(d)	Critical Thinking	5	
B	METACOGNITIVE SELF-REGULATION				11(.891)
C	RESOURCE MANAGEMENT	(a)	Environment Management	4	12 (.823)
		(b)	Effort Management	4	
		(c)	Help-Seeking	4	
					42 (.959)

Table 2 shows the distribution of items in the survey, which was adapted from the learning strategies instrument developed by Wenden and Rubin (1987). The questionnaire comprised 42 items in total, organised into three main variables. The Cognitive Components variable consisted of 19 items across four constructs: Rehearsal (4 items), Organization (4 items), Elaboration (6 items), and Critical Thinking (5 items). The Metacognitive Self-Regulation variable consisted of 11 items. The Resource Management variable consisted of 12 items across three constructs: Environment Management (4 items), Effort Management (4 items), and Help-Seeking (4 items).

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

To determine the internal reliability of the instrument, a reliability analysis was conducted. Table 3 above shows the distribution and interpretation of Cronbach's Alpha range. According to Ahmad et al. (2024), Cronbach's Alpha scores between 0.7 and 0.9 are considered acceptable to excellent.

Table 2 also shows the reliability of the survey. The analysis shows a Cronbach's alpha of .942 for Cognitive Components, .891 for Metacognitive Self-Regulation, and .823 for Resource Management (12 items). At the sub-construct level, Environment Management (4 items) alone had an alpha of .805, Effort Management (4

items) had an alpha of .622, and Help-Seeking (4 items) had an alpha of .679. The overall Cronbach's Alpha for all 42 items was .959, indicating good reliability of the instrument. Further analysis using SPSS was conducted to present the findings that address the research questions of this study.

FINDINGS

Demographic Analysis

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

Table 4: Percentage for Demographic Profile

Question	Demographic Profile	Categories	Percentage (%)
1	Gender	Male	47%
		Female	53%
2	Cluster	Science & Technology	55%
		Social Sciences, Humanities & Business	45%

Table 4 presents the demographic profile of the respondents involved in this study. A total of 238 respondents participated in the survey. In terms of gender, the respondents comprised 53% females and 47% males, indicating a relatively balanced gender distribution with a slightly higher representation of female students. Regarding the academic cluster, 55% of the respondents were from the Science and Technology cluster, while 45% were from the Social Sciences, Humanities and Business cluster. The balanced distribution across gender and academic clusters means the sample was not skewed toward one group. However, because participants were recruited through convenience sampling rather than random or stratified sampling, this balance does not by itself establish that the findings generalise to the wider population of Malaysian higher education students; the sample's representativeness beyond these 238 respondents remains a limitation of the study.

Inferential Statistics

According to He (2024), a T-test serves three main functions. Firstly, it is used to compare means, determining if the average scores (mean) or values of two groups, or one group against a known value, are different enough to be considered statistically meaningful and are not just due to random chance. Secondly, a T-test is used to test hypotheses about means, such as whether there is a significant difference in performance between two distinct groups. Lastly, a T-test is used to identify significant differences: it produces a p-value (significance value), and if this p-value is below a predetermined threshold (often 0.05), it indicates a statistically significant difference, allowing researchers to draw conclusions about the populations from which their samples were drawn. As both Gender (male/female) and Cluster (Science & Technology/Social Sciences, Humanities & Business) in this study comprise exactly two groups, an independent-samples T-test is the appropriate test for each comparison.

Findings for significant differences in learning strategies across gender and cluster

This section presents data to answer research question 1: Are there significant differences in learning strategies across gender and cluster?

H₀₁: There is no significant difference in learning strategies across gender and cluster.

Table 5: T-Test for Learning Strategies

		MEAN	SD	T-Statistics df	p-value	OUTCOME
Gender	Male	3.71	0.59	t(236)=-.670	0.504	H ₀ Accepted
	Female	3.75	0.48			
Cluster	Science & Technology	3.69	0.56	t(236)=-1.300	0.195	H ₀ Accepted
	Social Sciences, Humanities & Business					

With reference to Table 5, a T-test was conducted to examine the effects of learning strategies across gender and cluster. The analysis in Table 5 shows there is no significant difference between learning strategies across gender and cluster.

Descriptive Statistics

Mean (M) and standard deviation (SD) are reported to summarise the central tendency and variability of respondents' ratings for each construct. According to Vetter (2017), the mean represents the average, or centre, of a data set, while the standard deviation indicates the typical distance of individual observations from the mean, reflecting the data's variability or spread. A low SD means responses are clustered closely around the mean, indicating stronger consensus among respondents, whereas a high SD indicates more varied or spread-out responses, reflecting greater disagreement within the sample.

Findings for Environment Management

This section presents data to answer research question 2: How do learners perceive environment management in learning?

Table 6: Mean (M) and Standard Deviation (SD) for Environment Management (4 items)

ITEM	M	SD
RMCEMQ1: I usually study in a place where I can concentrate on my course work.	4.07	0.85
RMCEMQ2: I make good use of my study time for the courses in this program.	3.88	0.75
RMCEMQ3: I make sure that I keep up with the weekly readings and assignments for this course.	3.81	0.80
RMCEMQ4: I attend the classes regularly in this course.	4.28	0.82

Table 6 presents the mean and standard deviation for students' environmental management practices. Overall, the findings indicate that respondents demonstrated a relatively high level of environmental management, with mean scores ranging from 3.81 to 4.28. The highest is RMCEMQ4 with M=4.28:SD=0.82, where learners

report that they attend classes regularly, indicating that most students consistently manage their academic responsibilities. This was followed by RMCEMQ1 with $M=4.07:SD=0.85$, where learners try to find a quiet place to study. RMCEMQ2 with $M=3.88:SD=0.75$, and RMCEMQ3 with $M=3.81:SD=0.80$ obtained slightly lower mean scores, where learners kept up with weekly readings and assignments, while still reflecting positive environment management practices. To conclude, it can be said that respondents' responses were fairly consistent across all items due to relatively small standard deviation values. It is worth noting that only RMCEMQ1 refers directly to the physical study environment; RMCEMQ2, RMCEMQ3, and RMCEMQ4 relate more closely to time management, task completion, and attendance, a point taken up in the discussion and limitations.

Findings for Cognitive Components

This section presents data to answer research question 3: How do learners perceive cognitive components in learning? In the context of this study, this is measured by (i) rehearsal, (ii) organization, (iii) elaboration, and (iv) critical thinking.

Table 7: Mean (M) and Standard Deviation (SD) for Rehearsal (4 items)

ITEM	M	SD
LSCCRQ1: When I study for the classes, I practice saying the material to myself over and over.	3.68	0.80
LSCCRQ2: When studying for the courses, I read my class notes and the course readings over and over again.	3.69	0.84
LSCCRQ3: I memorize key words to remind me of important concepts in this class.	3.97	0.81
LSCCRQ4: I make lists of important items for the courses and memorize the lists.	3.80	0.90

Table 7 presents the mean (M) and standard deviation (SD) for rehearsal practices as learning strategies. Overall, the findings indicate that respondents demonstrated a relatively high level of rehearsal, with mean scores ranging from 3.68 to 3.97. The lowest mean was recorded for LSCCRQ1 ($M = 3.68$, $SD = 0.80$), which reflects students' tendency to practice by saying the class material to themselves repeatedly. The second lowest mean was for LSCCRQ2 ($M = 3.69$, $SD = 0.84$), indicating that students also engaged in rehearsal by reading their class notes and course readings repeatedly. The two highest means were for LSCCRQ3 ($M = 3.97$, $SD = 0.81$) and LSCCRQ4 ($M = 3.80$, $SD = 0.90$), suggesting that learners preferred to memorize key words and make lists of important items to remind themselves of related concepts in the class.

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

ITEM	M	SD
LSCCOQ1: When I study the readings for the courses in the program, I outline the material to help me organize my thoughts.	3.82	0.83
LSCCOQ2: When I study for the courses, I go through the readings and my class notes and try to find the most important ideas.	3.92	0.78

LSCCOQ3: I make simple charts, diagrams, or tables to help me organize course materials in this program.	3.37	1.06
LSCCOQ4: When I study for the courses, I go over my class notes and make an outline of important concepts.	3.77	0.84

Table 8 presents the mean and standard deviation for students' organizational learning strategies. Overall, the findings indicate that respondents demonstrated a relatively high level of organizational skills, with mean scores ranging from 3.37 to 3.92. The highest mean score was recorded for LSCCOQ2 ($M = 3.92$, $SD = 0.78$), indicating that students frequently reviewed their readings and class notes to identify the most important ideas. This was followed by LSCCOQ1 ($M = 3.82$, $SD = 0.83$), where learners outlined course materials to organise their thoughts, and LSCCOQ4 ($M = 3.77$, $SD = 0.84$), where learners reviewed class notes and prepared outlines of key concepts. The lowest mean score was obtained for LSCCOQ3 ($M = 3.37$, $SD = 1.06$), suggesting that students were less likely to use visual organisational tools such as charts, diagrams, or tables when studying. Overall, the relatively small standard deviation values indicate that respondents demonstrated fairly consistent organisational learning practices, although the higher variability observed for LSCCOQ3 suggests differences in learners' preferences for using visual learning aids.

Table 9: Mean (M) and Standard Deviation (SD) for Elaboration (6 items)

ITEM	M	SD
LSCCEQ1: When I study for the courses in this program, I pull together information from different sources, such as lectures, readings, and discussions.	3.75	0.85
LSCCEQ2: I try to relate ideas in one subject to those in other courses whenever possible	3.66	0.85
LSCCEQ3: When reading for the courses, I try to relate the material to what I already know.	4.00	0.75
LSCCEQ4: When I study for the courses in this program, I write brief summaries of the main ideas from the readings and my class notes.	3.66	0.94
LSCCEQ5: I try to understand the material in the classes by making connections between the readings and the concepts from the lectures.	3.87	0.74
LSCCEQ6: I try to apply ideas from course readings in other class activities, such as lecture and discussion.	3.77	0.82

Table 9 presents the mean and standard deviation for students' elaboration practices. Overall, the findings indicate that respondents demonstrated a relatively high level of elaboration, with mean scores ranging from 3.66 to 4.00. The highest is LSCCEQ3 with $M=4.00:SD=0.75$, where learners relate the course material to what they already know while reading, indicating that students frequently connect new knowledge with their prior understanding. This was followed by LSCCEQ5 with $M=3.87:SD=0.74$, where learners try to understand the material by making connections between the readings and lecture concepts. LSCCEQ6 with $M=3.77:SD=0.82$ and LSCCEQ1 with $M=3.75:SD=0.85$ also recorded relatively high mean scores, reflecting students' ability to apply ideas from course readings in class activities and integrate information from different sources. The lowest mean scores were obtained for LSCCEQ2 with $M=3.66:SD=0.85$ and LSCCEQ4 with $M=3.66:SD=0.94$. These findings suggest that students were less likely to relate ideas across different courses or write summaries of the main ideas from readings and class notes. To conclude, it can be said that

respondents' responses were fairly consistent across most items due to the relatively small standard deviation values.

Table 10: Mean (M) and Standard Deviation (SD) for Critical Thinking (5 items)

ITEM	M	SD
LSCCCTQ1: I often find myself questioning things I hear or read in the courses to decide if I find them convincing.	3.71	0.82
LSCCCTQ2: When a theory, interpretation, or conclusion is presented in classes or in the readings, I try to decide if there is good supporting evidence.	3.71	0.81
LSCCCTQ3: I treat the course materials as a starting point and try to develop my own ideas about it.	3.68	0.84
LSCCCTQ4: I try to play around with ideas of my own related to what I am learning in the courses.	3.77	0.84
LSCCCTQ5: Whenever I read or hear an assertion or conclusion in the classes, I think about possible alternatives.	3.69	0.85

Table 10 presents the mean and standard deviation for students' critical thinking practices. Overall, the findings indicate that respondents demonstrated a consistently moderate level of critical thinking, with mean scores ranging narrowly from 3.68 to 3.77. The highest mean was recorded for LSCCCTQ4 ($M = 3.77$, $SD = 0.84$), indicating that students often experimented with their own ideas about topics covered in their courses. This was closely followed by LSCCCTQ1 and LSCCCTQ2, both at $M = 3.71$ ($SD = 0.82$ and 0.81 respectively), reflecting learners' tendency to question what they hear or read and to evaluate whether a theory or interpretation is well supported by evidence. LSCCCTQ5 ($M = 3.69$, $SD = 0.85$) showed that learners also considered alternative explanations when encountering an assertion or conclusion. The lowest mean was recorded for LSCCCTQ3 ($M = 3.68$, $SD = 0.84$), suggesting that students were comparatively less inclined to treat course materials as a starting point for developing their own ideas. To conclude, the narrow range of means and consistently moderate standard deviations indicate that respondents engaged in critical thinking fairly evenly across items, though slightly less strongly than in other cognitive strategies such as elaboration.

Findings for Metacognitive Components

This section presents data to answer research question 4: How do learners perceive metacognitive components in learning?

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

ITEM	M	SD
MSSRQ1: During class time, I often miss important points because I am thinking of other things.	3.20	0.95
MSSRQ2: When reading for the courses, I make up questions to help focus my reading.	3.54	0.92
MSSRQ3: When I become confused about something I am reading for the classes, I go back and try to figure it out.	3.82	0.86

MSSRQ4: If course readings are difficult to understand, I change the way I read the material.	3.75	0.89
MSSRQ5: Before I study new course material thoroughly, I often skim it to see how it is organized	3.58	0.92
MSSRQ6: I ask myself questions to make sure I understand the material I have been studying in this program.	3.74	0.81
MSSRQ7: I try to change the way I study in order to fit any course requirements and the instructors' teaching style.	3.64	0.83
MSSRQ8: I 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.	3.72	0.81
MSSRQ9: When studying for the courses in this program I try to determine which concepts I do not understand well.	3.81	0.82
MSSRQ10: When I study for the courses, I set goals for myself in order to direct my activities in each study period.	3.73	0.85
MSSRQ11: If I get confused taking notes in classes, I make sure I sort it out afterwards.	3.65	0.90

Table 11 presents the mean and standard deviation for students' metacognitive self-regulation practices. Overall, the findings indicate that respondents demonstrated a moderately high level of metacognitive self-regulation, with mean scores ranging from 3.20 to 3.82. The highest mean score was recorded for MSSRQ3 ($M = 3.82$, $SD = 0.86$), indicating that learners tended to revisit and resolve confusing course materials when they encountered difficulties.

This was closely followed by MSSRQ9 ($M = 3.81$, $SD = 0.82$), where learners identified concepts they did not understand well, and MSSRQ4 ($M = 3.75$, $SD = 0.89$), which reflects learners' ability to modify their reading strategies when course materials were difficult to comprehend. In contrast, the lowest mean score was reported for MSSRQ1 ($M = 3.20$, $SD = 0.95$), suggesting that some learners occasionally lost focus during class due to unrelated thoughts. Overall, the relatively low standard deviation values indicate that respondents displayed consistent metacognitive self-regulation behaviours across most items, reflecting their ability to monitor, adjust, and evaluate their learning processes effectively.

Findings for Resource Management

This section presents data to answer research question 5: How do learners perceive resource management in learning? In the context of this study, this is measured by (i) effort management and (ii) help-seeking.

Table 12: Mean (M) and Standard Deviation (SD) for Effort Management (4 items)

ITEM	M	SD
RMCEFMQ1: I have a regular place set aside for studying	3.80	0.86
RMCEFMQ2: I work hard to do well in the classes in this program even if I do not like what we are doing.	3.84	0.82

RMCEFMQ3: When course work is difficult, I either give up or only study the easy parts.	3.14	1.13
RMCEFMQ4: Even when course materials are dull and uninteresting, I manage to keep working until I finish.	3.89	0.78

Table 12 presents the mean and standard deviation for students' effort regulation practices. Overall, the findings indicate that respondents demonstrated a moderately high level of effort regulation, with mean scores ranging from 3.14 to 3.89. The highest is RMCEFMQ4 with $M=3.89:SD=0.78$, where learners manage to keep working until they finish, even when the course materials are dull and uninteresting, indicating that students generally persevere despite a lack of interest in the learning materials.

This was followed by RMCEFMQ2 with $M=3.84:SD=0.82$, where learners work hard to do well in their classes even if they do not like what they are doing. RMCEFMQ1 with $M=3.80:SD=0.86$ reflects that learners have a regular place set aside for studying. The lowest mean score was recorded for RMCEMQ3, with $M=3.14:SD=1.13$, where learners reported that they either give up or only study the easy parts when coursework is difficult. To conclude, it can be said that respondents generally demonstrated positive effort regulation practices. However, the relatively higher standard deviation for RMCEFMQ3 indicates greater variation in respondents' responses for this item compared to the others.

Table 13: Mean(M) and Standard Deviation (SD) for Help-Seeking (4 items)

ITEM	M	SD
RMCHSQ1: When I cannot understand the material in a course, I ask my lecturer for help.	3.55	0.87
RMCHSQ2: When I cannot understand the material in a course, I ask another student in the class for help.	4.03	0.89
RMCHSQ3: When I cannot understand the material in a course, I ask my friends from other class for help.	3.66	1.11
RMCHSQ4: When I cannot understand the material in a course, I ask my seniors who have taken the course previously for help.	3.07	1.29

Table 13 presents the mean and standard deviation for students' help-seeking practices. Overall, the findings indicate that respondents demonstrated a moderately high but more varied level of help-seeking behaviour, with mean scores ranging from 3.07 to 4.03. The highest mean score was recorded for RMCHSQ2 ($M = 4.03$, $SD = 0.89$), where learners ask another student in the class for help, suggesting that most students are proactive in turning to peers when they are unsure of the material. This was followed by RMCHSQ3 ($M = 3.66$, $SD = 1.11$), where learners ask friends from other classes for help, and RMCHSQ1 ($M = 3.55$, $SD = 0.87$), where learners ask their lecturer for help. In contrast, the lowest mean score was recorded for RMCHSQ4 ($M = 3.07$, $SD = 1.29$), where learners were least likely to ask seniors who had previously taken the course for help. To conclude, it can be said that respondents generally preferred seeking help from classmates over lecturers or seniors, and the comparatively higher standard deviation for RMCHSQ4 indicates that respondents' willingness to seek help from seniors varied more widely than their other help-seeking behaviours.

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 is a common tool for describing simple relationships without making a statement about cause and effect. This section presents data to answer research question on correlation.

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

To determine if there is a significant association in the mean scores between Environment Management, Cognitive, Metacognitive components, and Resource Management, data is analysed using SPSS for correlations. Results are presented separately in Table 14 below.

Table 14: Correlation between Environment Management, Cognitive, Metacognitive components, and Resource Management

		COGNITIVE	METACOGNITIVE	RESOURCE MANAGEMENT
ENVIRONMENT MANAGEMENT	Pearson Correlation	.662**	.624**	.566**
	Sig. (2- tailed)	<.001	<.001	<.001
	N	238	238	238
**. Correlation is significant at the 0.01 level (2-tailed).				

Findings for the Relationship between environmental management and cognitive components

This section presents data to answer research question 6: Is there a relationship between environmental management and cognitive components?

H₀₂: There is no significant relationship between environmental management and cognitive components.

Table 14 shows there is an association between environmental management and cognitive components. Correlation analysis shows that there is a high significant association between environmental management and cognitive components ($r=.662^{**}$) and ($p=<.001$). This means that there is also a strong positive relationship between environmental management and cognitive components. Null hypothesis is rejected for H₀₂.

Findings for Relationship between environmental management and metacognitive components

This section presents data to answer research question 7: Is there a relationship between environmental management and metacognitive components?

H₀₃: There is no significant relationship between environmental management and metacognitive components.

Table 14 also shows there is an association between environmental management and metacognitive components. Correlation analysis shows that there is a high significant association between environmental management and metacognitive components ($r=.624^{**}$) and ($p=<.001$). This means that there is also a strong positive relationship between environmental management and metacognitive components. Null hypothesis is rejected for H₀₃.

Findings for Relationship between environmental management and resource management

This section presents data to answer research question 8: Is there a relationship between environmental

management and resource management?

H₀₄: There is no significant relationship between environmental management and resource management

Table 14 also shows there is an association between environmental management and resource management (the Resource Management score used here excludes the Environment Management items to avoid part-whole overlap). Correlation analysis shows that there is a high significant association between environmental management and resource management ($r=.566^{**}$) and ($p=<.001$). This means that there is also a strong positive relationship between environmental management and resource management. Null hypothesis is rejected for H₀₄.

CONCLUSION

Summary of Findings and Discussions

This study examined the relationship between environment management and cognitive, metacognitive, and resource management components, and whether this differs by gender and academic cluster. The T-test showed no significant difference by gender or cluster (RQ1), consistent with Zimmerman's (2020) view of self-regulation as a general competency.

Learners generally managed their environment positively, especially in attending classes regularly, though only one of the four Environment Management items directly concerns the physical study space (RQ2); the finding therefore only partly echoes Chong et al. (2025), Noor Saad and Md Yunus (2015), and Beckers et al. (2016) on the role of the physical learning space, and is discussed further as a construct-validity limitation below. Cognitive strategy use was high, led by elaboration and lowest for visual organisation tools (RQ3), partly matching Rasdi et al. (2025) but contrasting with Chandaran and Hashim (2022). Metacognitive self-regulation was moderately high, most often revisiting confusing material (RQ4), in line with Chandaran and Hashim (2022) and Zimmerman (2020).

Resource management was used positively, with environment management scoring highest and help-seeking from seniors lowest (RQ5), consistent with Rasdi et al. (2025) and Tadesse et al. (2022). Environment management was significantly and strongly related to cognitive components, metacognitive components, and resource management (RQ6–8), rejecting Ho2, Ho3, and Ho4 and echoing Rasdi et al. (2025), Chong et al. (2025), Bandura (2012), and Zimmerman (2020).

Overall, environment management is significantly and positively related to the other three components regardless of gender or cluster, highlighting it as an important correlate of cognitive and metacognitive engagement rather than a peripheral concern.

Implications and Suggestions for Future Research

Theoretical and Conceptual Implications

These findings are consistent with Bandura's (2012) reciprocal determinism and Zimmerman's (2020) Self-Regulated Learning Theory, showing that environmental conditions are associated with cognitive and metacognitive engagement, and lend support to this study's conceptual framework, which positioned environment management as closely related to cognitive, metacognitive, and resource management. This supports treating environment management as a distinct construct rather than a peripheral sub-component of resource management, though the cross-sectional design means these associations should not be read as evidence that environment management drives or produces the other components. A caveat to this conclusion is that, of the four items used to measure Environment Management in this study, only one (RMCEMQ1, studying in a place free of distraction) refers directly to the physical or spatial study environment; the remaining three concern time management (RMCEMQ2), keeping up with coursework (RMCEMQ3), and class attendance (RMCEMQ4). The construct as operationalised here therefore captures a broader pattern of academic self-management alongside, rather than purely, environmental regulation, and this should be taken

into account when interpreting the strength of its relationship with the other components and when comparing these findings to studies that measure environment management more narrowly.

Beyond this conceptual caveat, several other pieces of evidence support retaining Environment Management as a construct in its own right rather than as a redundant extraction from Resource Management. First, Environment Management correlates more strongly with Cognitive ($r=.662$) and Metacognitive ($r=.624$) components than with the remainder of Resource Management itself ($r=.566$, excluding the Environment Management items); if Environment Management were simply redundant with Effort Management and Help-Seeking, it would be expected to correlate most strongly with its own parent scale rather than with the other two components.

Second, Environment Management's internal consistency ($\alpha=.805$) is higher than that of Effort Management ($\alpha=.622$) or Help-Seeking ($\alpha=.679$) considered individually, indicating that its four items cohere as a distinct, internally consistent set. Third, this treatment is consistent with prior literature that examines the physical and spatial learning environment as a construct distinct from general resource management, including Beckers et al. (2016) and Noor Saad and Md Yunus (2015), both of which found that the physical learning space independently shapes student engagement and outcomes. A formal factor-analytic test of the three-construct structure was beyond the scope of this study; nonetheless, this pattern of evidence offers reasonable support for retaining Environment Management as a distinct component of Resource Management.

Pedagogical Implications

Pedagogically, educators could model visual organisation strategies such as concept maps and introduce structured peer-mentoring to encourage help-seeking from seniors, since both were the least-used strategies. Guidance on managing study time and space should also be embedded into orientation or study-skills programmes, and since no differences emerged by gender or cluster, such interventions can be applied broadly across the student population.

Suggestions for Future Research

This study's cross-sectional, correlational design means the relationships reported here should be interpreted as associations rather than causal effects; future researchers could examine whether environment management differs by other demographic variables such as year of study or mode of study, as recommended by Rasdi et al. (2025); adopt a longitudinal or intervention-based design, as suggested by Trentepohl et al. (2023), which would allow stronger causal claims about environment management's relationship with the other components; or use a mixed-methods approach to explore why learners underutilise strategies such as visual organisation tools and help-seeking from seniors.

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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	(a)	Rehearsal	4	19
		(b)	Organization	4	
		(c)	Elaboration	6	
		(d)	Critical Thinking	5	
B	METACOGNITIVE SELF-REGULATION				11
C	RESOURCE MANAGEMENT	(a)	Environment Management	4	12
		(b)	Effort Management	4	
		(c)	Help-Seeking	4	
					42

Learning Strategies

Cognitive Components (19 Items)

Rehearsal (4 items)

		1	2	3	4	5
1	LSCCRQ1: When I study for the classes, I practice saying the material to myself over and over.					
2	LSCCRQ2: When studying for the courses, I read my class notes and the course readings over and over again.					

3	LSCCRQ3: I memorize key words to remind me of important concepts in this class.					
4	LSCCRQ4: I make lists of important items for the courses and memorize the lists.					

Organization (4 items)

		1	2	3	4	5
1	LSCCOQ1: When I study the readings for the courses in the program, I outline the material to help me organize my thoughts.					
2	LSCCOQ2: When I study for the courses, I go through the readings and my class notes and try to find the most important ideas.					
3	LSCCOQ3: I make simple charts, diagrams, or tables to help me organize course materials in this program.					
4	LSCCOQ4: When I study for the courses, I go over my class notes and make an outline of important concepts.					

Elaboration (6 items)

		1	2	3	4	5
1	LSCCEQ1: When I study for the courses in this program, I pull together information from different sources, such as lectures, readings, and discussions.					
2	LSCCEQ2: I try to relate ideas in one subject to those in other courses whenever possible					
3	LSCCEQ3: When reading for the courses, I try to relate the material to what I already know.					
4	LSCCEQ4: When I study for the courses in this program, I write brief summaries of the main ideas from the readings and my class notes.					
5	LSCCEQ5: I try to understand the material in the classes by making connections between the readings and the concepts from the lectures.					
6	LSCCEQ6: I try to apply ideas from course readings in other class activities such as lecture and discussion.					

Critical Thinking (5 items)

		1	2	3	4	5

1	LSCCCTQ1: I often find myself questioning things I hear or read in the courses to decide if I find them convincing.					
2	LSCCCTQ2: When a theory, interpretation, or conclusion is presented in classes or in the readings, I try to decide if there is good supporting evidence.					
3	LSCCCTQ3: I treat the course materials as a starting point and try to develop my own ideas about it.					
4	LSCCCTQ4: I try to play around with ideas of my own related to what I am learning in the courses.					
5	LSCCCTQ5: Whenever I read or hear an assertion or conclusion in the classes, I think about possible alternatives.					

Metacognitive Self-Regulation (11 items)

		1	2	3	4	5
1	MSSRQ1: During class time, I often miss important points because I am thinking of other things.					
2	MSSRQ2: When reading for the courses, I make up questions to help focus my reading.					
3	MSSRQ3: When I become confused about something I am reading for the classes, I go back and try to figure it out.					
4	MSSRQ4: If course readings are difficult to understand, I change the way I read the material.					
5	MSSRQ5: Before I study new course material thoroughly, I often skim it to see how it is organized					
6	MSSRQ6: I ask myself questions to make sure I understand the material I have been studying in this program.					
7	MSSRQ7: I try to change the way I study in order to fit any course requirements and the instructors' teaching style.					
8	MSSRQ8: I 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	MSSRQ9: When studying for the courses in this program I try to determine which concepts I do not understand well.					
10	MSSRQ10: When I study for the courses, I set goals for myself in order to direct my activities in each study period.					
11	MSSRQ11: If I get confused taking notes in classes, I make sure I sort it out afterwards.					

Resource Management Component (12 Items)

Environment Management (4 items)

		1	2	3	4	5
1	RMCEMQ1: I usually study in a place where I can concentrate on my course work.					
2	RMCEMQ2: I make good use of my study time for the courses in this program.					
3	RMCEMQ3: I make sure that I keep up with the weekly readings and assignments for this course.					
4	RMCEMQ4: I attend the classes regularly in this course.					

Effort Management (4 items)

		1	2	3	4	5
1	RMCEFMQ1: I have a regular place set aside for studying					
2	RMCEFMQ2: I work hard to do well in the classes in this program even if I do not like what we are doing.					
3	RMCEFMQ3: When course work is difficult, I either give up or only study the easy parts.					
4	RMCEFMQ4: Even when course materials are dull and uninteresting, I manage to keep working until I finish.					

Help-Seeking (4 items)

		1	2	3	4	5
1	RMCHSQ1: When I cannot understand the material in a course, I ask my lecturer for help.					
2	RMCHSQ2: When I cannot understand the material in a course, I ask another student in the class for help.					
3	RMCHSQ3: When I cannot understand the material in a course, I ask my friends from other class for help.					
4	RMCHSQ4: When I cannot understand the material in a course, I ask my seniors who have taken the course previously for help.					