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Inside the learning mind: a study of metacognitive behaviors in a public high school

PANELO, Karl Bryan[1]; ISIDRO, Jefferson[2]

[1] 0009-0007-8627-7199; Don Mariano Marcos Memorial State University – South La Union Campus. Agoo, La Union (AGOO, LU), Philippines. kbpanelo@dmmmsu.edu.ph.
[2] 0000-0002-4433-8228; Don Mariano Marcos Memorial State University – South La Union Campus. Agoo, La Union (AGOO, LU), Philippines. jisidro@dmmmsu.edu.ph.

A B S T R A C T

This study aimed to determine the level of metacognitive awareness among Junior High School (JHS) and Senior High School (SHS) learners in a public national high school, focusing on the two core domains: Knowledge of Cognition and Regulation of Cognition. A quantitative descriptive design was employed using the Metacognitive Awareness Inventory as the standardized instrument. Data were collected from JHS and SHS students and analyzed to determine their metacognitive strengths and weaknesses. Results showed that both groups demonstrated moderately high levels of Knowledge of Cognition. JHS learners scored higher in Declarative and Conditional Knowledge, suggesting a stronger foundational understanding and better decision-making regarding learning strategies. Procedural Knowledge was moderately developed across both groups. In the Regulation of Cognition, learners exhibited strengths in Planning and Comprehension Monitoring, while Evaluation and Debugging Strategies were less developed. JHS students also outperformed SHS learners in several subdomains, indicating a possible decline in metacognitive engagement in higher grade levels. The study concludes that while learners possess promising metacognitive awareness levels, gaps remain in Procedural Knowledge, Information Management, and Evaluation. These findings suggest the need for structured instructional practices explicitly teaching metacognitive strategies to support learners' academic growth and independent learning. Embedding metacognitive training in classroom activities can help bridge the gap between current abilities and optimal development.

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RESUME

Este estudo teve como objetivo determinar o nível de consciência metacognitiva entre alunos do Ensino Fundamental II (JHS) e do Ensino Médio (SHS) em uma escola pública nacional, com foco nos dois domínios principais: Conhecimento da Cognição e Regulação da Cognição. Um delineamento descritivo quantitativo foi empregado usando o Inventário de Consciência Metacognitiva como instrumento padronizado. Dados foram coletados de alunos do JHS e do SHS e analisados para determinar seus pontos fortes e fracos metacognitivos. Os resultados mostraram que ambos os grupos demonstraram níveis moderadamente altos de Conhecimento da Cognição. Os alunos do JHS pontuaram mais alto em Conhecimento Declarativo e Condicional, sugerindo uma compreensão fundamental mais forte e melhor tomada de decisão em relação às estratégias de aprendizagem. O Conhecimento Procedural foi moderadamente desenvolvido em ambos os grupos. Na Regulação da Cognição, os alunos exibiram pontos fortes em Planejamento e Monitoramento da Compreensão, enquanto Estratégias de Avaliação e Depuração foram menos desenvolvidas. Os alunos do JHS também superaram os alunos do SHS em vários subdomínios, indicando um possível declínio no engajamento metacognitivo em níveis de ensino mais altos. O estudo conclui que, embora os alunos apresentem níveis promissores de consciência metacognitiva, ainda existem lacunas em Conhecimento Procedural, Gestão da Informação e Avaliação. Essas descobertas sugerem a necessidade de práticas instrucionais estruturadas que ensinem explicitamente estratégias metacognitivas para apoiar o crescimento acadêmico e a aprendizagem independente dos alunos. A incorporação do treinamento metacognitivo às atividades em sala de aula pode ajudar a preencher a lacuna entre as habilidades atuais e o desenvolvimento ideal.

Keywords:
metacognição,
consciência metacognitiva,
conhecimento da cognição,
regulação da cognição

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Introduction

In the 21st century, the educational landscape demands more than knowledge acquisition—it calls for cultivating higher-order thinking and self-directed learning skills. Students are no longer expected to be passive recipients of information but are instead required to engage in meaningful learning processes that promote autonomy, adaptability, and critical thinking. One of the most essential competencies aligned with this shift is metacognition, commonly defined as "thinking about thinking." It refers to the awareness and regulation of one's cognitive processes, encompassing the ability to plan, monitor, evaluate, and adjust learning strategies in real time (Flavell, 1979; Schraw & Dennison, 1994). Metacognition is particularly relevant in preparing learners for academic success, lifelong learning, and problem-solving in a globalized and fast-changing world.

Empirical studies on academic outcomes have consistently highlighted the role of metacognitive awareness in enhancing students' academic outcomes across content areas. Students who are metacognitively aware are more capable of setting goals, managing their time effectively, assessing their comprehension, and modifying their learning strategies to improve performance. In Bloom's revised taxonomy, metacognition is situated at the highest cognitive level, underlining its importance in facilitating deep and transferable learning (Anderson & Krathwohl, 2001; Karaali, 2015). Research has shown that metacognitive awareness can positively impact learners' achievement in mathematics (Lao & Divinagracia, 2022), reading comprehension (Britania & Acosta, 2024), and English language performance (Guzman, 2019). Moreover, instructional innovations such as the flipped classroom (Limueco & Prudente, 2019) and strategy-based instruction (Suarez & Tagadiad, 2023) have been linked to improved metacognitive engagement and learner autonomy.

However, research distribution across educational levels remains uneven, studies on metacognitive awareness have mainly been concentrated in tertiary education contexts, leaving a significant research gap at the secondary level, particularly within the Philippine educational system. Most investigations target college learners, while limited research has been conducted involving junior and senior high school students, especially in rural or public secondary school settings. Furthermore, few studies have systematically examined both components of metacognition—knowledge of cognition and regulation of cognition—across academic strands. Addressing these gaps is critical, as adolescence is a formative period for developing self-regulated learning habits that can shape long-term academic trajectories and personal growth. Regional disparities also merit attention; for instance, Das et al. (2024) identified that urban learners exhibited higher metacognitive awareness than their rural peers, underscoring the need for localized data to support equitable educational interventions.

Despite these contributions, empirical work on how metacognitive awareness differs across secondary grade levels in public school contexts has been limited. Failure to understand

these developmental nuances may result in mismatched instructional strategies, where teaching approaches do not align with learners' evolving cognitive regulation needs. Establishing the metacognitive profiles of junior and senior high school learners is therefore essential for informing responsive curriculum design, targeted interventions, and teacher professional development initiatives.

This study is grounded in the theoretical framework of Schraw and Dennison (1994), which conceptualizes metacognition through two interrelated dimensions: knowledge of cognition and regulation of cognition. Knowledge of cognition refers to declarative knowledge (awareness of one's cognitive abilities), procedural knowledge (understanding how to implement learning strategies), and conditional knowledge (knowing when and why to use specific strategies). Regulation of cognition involves planning, information management, comprehension monitoring, debugging strategies, and evaluation—all essential for effectively managing one's learning processes. These dimensions form the basis of the Metacognitive Awareness Inventory (MAI), a standardized tool used in this study to measure students' metacognitive profiles.

The present research aims to assess the metacognitive awareness of junior and senior high school learners enrolled in a public secondary school in Northern Luzon, Philippines, during the academic year 2024–2025. It investigates students across different academic strands to provide a comprehensive understanding of how metacognitive skills manifest at the secondary level. Drawing from developmental research suggesting that metacognitive regulation may fluctuate during adolescence as academic demands increase, the study anticipates observable differences between junior and senior high school learners. Specifically, the study seeks to answer the following questions: (1) What are the levels of knowledge of cognition and regulation of cognition among junior and senior high school learners? and (2) What is the overall level of metacognitive awareness among the learners in the selected public secondary school? By addressing these questions, the study aims to contribute to the knowledge of metacognition at the secondary level and inform future instructional practices and educational policies. Findings may also support the development of contextually responsive programs within teacher education. The findings are expected to guide evidence-based instructional design and support educators in embedding metacognitive strategy instruction within classroom practice.

Methodology

Research Design

This study employs a cross-sectional quantitative descriptive design, capturing metacognitive awareness at a single point in time. Consequently, observed differences between grade levels should be interpreted as cohort-based rather than developmental changes. This

design is appropriate for objectively describing a specific population's characteristics using numerical data without manipulating variables (Creswell & Creswell, 2018).

Using the standardized Metacognitive Awareness Inventory (MAI), the study measures students' knowledge of and regulation of cognition. The results will be analyzed using descriptive statistics to accurately assess the learners' metacognitive skills. Similar approaches have been used in prior studies, such as those by Lao and Divinagracia (2022) and Limueco and Prudente (2019), demonstrating the effectiveness of descriptive quantitative designs in investigating metacognitive awareness in secondary education settings. The study intentionally relies on descriptive statistics to establish baseline metacognitive profiles rather than test causal or predictive relationships. Future studies may extend this work using inferential approaches.

Sources of Data

The participants of this study are learners enrolled for the Academic Year 2024–2025 in a public national high school located in La Union, Philippines. The sample includes students from both junior high school (Grades 7 to 10) and senior high school (Grades 11 and 12), representing various academic strands such as Science, Technology, Engineering, and Mathematics (STEM); Humanities and Social Sciences (HUMSS); Accountancy, Business, and Management (ABM); and Technical-Vocational-Livelihood (TVL).

Table 1

Population of the study

	Junior High School				Senior High School		Total
	Grade 7	Grade 8	Grade 9	Grade 10	Grade 11	Grade 12	
Population	155	155	155	170	161	164	960
Sample	44	44	44	49	46	48	275

As shown in Table 1, the population of this study comprises junior and senior high school learners enrolled in a public national high school in La Union for the academic year 2024–2025. According to enrollment data, are 155 students each in Grades 7, 8, and 9; 170 in Grade 10; 161 in Grade 11; and 164 in Grade 12.

A stratified random sampling technique was employed to ensure proportional representation across all grade levels, with a random number generator used to select participants within each stratum, thereby giving every student an equal chance of selection. Cochran's formula was used to determine the appropriate sample size; the final sample size used in the analysis consisted of 275 students.

Instrumentation

This study utilizes the Metacognitive Awareness Inventory (MAI), initially developed by Schraw and Dennison (1994), to assess learners' metacognitive awareness. The MAI comprises 52 true-or-false statements designed to evaluate two primary components of

metacognition: knowledge of cognition (17 items) and regulation of cognition (35 items). The knowledge of cognition component encompasses declarative, procedural, and conditional knowledge, while the regulation of cognition component includes planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation.

The MAI has undergone extensive validation across diverse educational contexts, demonstrating its reliability and applicability. For instance, a study conducted at a private medical university in India validated a 40-item version of the MAI among 933 first-year medical and dental students. The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) supported a six-factor model with high internal consistency (Cronbach's $\alpha \geq 0.9$). Fit indices such as the Comparative Fit Index (0.78), Goodness-of-Fit Index (0.8), and Root Mean Square Error of Approximation (0.09) indicated a satisfactory model fit, affirming the instrument's construct validity.

Similarly, a study in Indonesia employed the MAI to assess metacognitive awareness among early childhood education students. Using the Rasch model, the Indonesian version of the MAI demonstrated high reliability (item reliability = 0.98) and validity, with one dominant component explaining 95.41% of the total variance. These findings underscore the MAI's robustness in different cultural settings.

Given its validated structure and proven reliability, the MAI is well-suited for evaluating metacognitive awareness among junior and senior high school learners in the Philippine context. Its comprehensive coverage of metacognitive components ensures a nuanced understanding of learners' cognitive processes, aligning with the objectives of this study.

Data Collection

The data collection process commenced with obtaining the necessary approvals and permissions from the appropriate school authorities. A formal letter of intent detailing the study's objectives, methodology, ethical safeguards, and relevance was submitted to the principal of a public national high school in Northern Luzon. Upon approval, the researcher provided a comprehensive explanation of the study to the prospective participants, including its purpose, scope, and the rights of the participants, such as confidentiality, anonymity, and the voluntary nature of their involvement.

To ensure ethical compliance, informed consent was obtained from the students and their parents or legal guardians. Once permission was secured, the Metacognitive Awareness Inventory (MAI), a standardized and widely validated instrument, was administered to the participants in a structured environment. This setting ensured minimal distractions and maintained consistency across all sessions.

The administration followed standardized procedures to safeguard the reliability of the responses. All completed inventories were collected, coded, and securely stored to ensure the

confidentiality and anonymity of the participants. Only aggregate data were used to report the results, strictly adhering to ethical research practices.

Results and Discussion

In assessing the levels of knowledge of cognition and regulation of cognition among junior and senior high school learners, the researcher utilized the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison (1994). The instrument comprises 52 true-or-false items measuring two metacognitive domains: Knowledge of Cognition (declarative, procedural, and conditional knowledge) and Regulation of Cognition (planning, information management, comprehension monitoring, debugging, and evaluation). Subdomains are defined once for clarity and interpreted in subsequent analyses. Participants responded with "true" if a statement applied to them and "false" if it did not. Each "true" response was scored 1, and each "false" response was scored 0. The scores were then aggregated to determine individual and group metacognitive awareness levels.

The MAI has been validated and widely used in various educational contexts. For instance, a study by Young and Fry (2008) demonstrated its reliability in measuring metacognitive awareness among college students. A validation study conducted in Myanmar confirmed the instrument's applicability in assessing metacognitive awareness among high school students (Win & Myint, 2022). These studies support the MAI's effectiveness in evaluating the metacognitive components targeted in this research.

The categorization of Metacognitive Awareness Levels in Table 2 is based on a statistical framework that converts quantitative mean scores into qualitative descriptors (Pornel, 2011). Using five ordered levels: Very Low, Low, Moderate, High, and Very High, along with fixed percentage intervals of the scale range, was adopted from the study of Siti Rahayu (2020). The system establishes clear-cut-off points for classifying respondents along a continuum of metacognitive awareness. In this structure, higher categories indicate stronger and more consistent engagement, identifying those who are highly proficient at “driving their brain,” whereas scores in the lower categories range suggest limited or infrequent use of metacognitive strategies.

Table 2

Metacognitive Awareness Level

Interval			Interpretation
	X	≤ 43.75	Very Low
$43.75 <$	X	≤ 56.25	Low
$56.25 <$	X	≤ 68.75	Medium
$68.75 <$	X	≤ 81.25	High
$81.25 <$	X		Very High

This interpretative approach enhances the pedagogical value of the data by moving beyond raw numerical scores toward meaningful educational implications (Suarez, 2023). Learners in the higher categories may be described as strategically engaged and capable of self-directed learning, while those in the lower categories may require explicit instruction and scaffolded support in metacognitive regulation (Velasquez, 2013). Additionally, the framework enables comparative analysis across grade levels, allowing researchers and educators to identify developmental trends and shifts in metacognitive awareness within and between cohorts.

The results presented in Table 3 indicate that Junior High School learners (Grades 7-10) demonstrate a High level of metacognitive awareness in the domain of Knowledge of Cognition, with an aggregate percentage of 77.73%. Crucially, the table provides a detailed statistical summary by including both the mean scores and the standard deviation (SD) of the scores for each subdomain, which allows for an assessment of the variability and consistency of the learners' self-reported awareness.

Table 3

Knowledge of Cognition Scores of Learners

Grade Level	Declarative Knowledge	Procedural Knowledge	Conditional Knowledge	Knowledge about Cognition
	Max-8	Max-4	Max-5	Total (%)
Grade 7	5.30	2.86	3.68	70.47
Grade 8	5.48	3.27	4.27	78.58
Grade 9	5.43	3.48	4.41	81.00
Grade 10	5.82	3.27	4.37	80.56
Grade 11	4.09	2.67	3.80	64.67
Grade 12	5.21	3.38	4.15	77.47
JHS Learners	5.51±1.66	3.22±0.93	4.19±0.93	77.73
SHS Learners	4.66±1.77	3.03±1.03	3.80±1.10	71.21

This component of metacognition is analyzed through three distinct subdomains: declarative knowledge, which refers to what learners know about their own skills and intellectual resources (5.51 ± 1.66); procedural knowledge, reflecting their awareness of how to execute specific learning strategies (3.22 ± 0.93); and conditional knowledge, measuring their understanding of when and why to apply those strategies (4.19 ± 0.93). Including standard deviations alongside reported means provides important insight for academic interpretation. A relatively larger variability, such as the ±1.66 observed in declarative knowledge, indicates a broader dispersion of responses within the group. This suggests that although the overall mean reflects a high level of awareness, individual differences remain pronounced, and a notable proportion of learners may exhibit comparatively lower levels of metacognitive knowledge, thereby warranting targeted instructional support or intervention (Yang, 2017).

Based on these findings, several implications and suggestions for the academe emerge. First, educators should use the Metacognitive Awareness Inventory (MAI) or its junior version as a diagnostic screening tool to identify learners who fall below the "High" bracket, enabling targeted support rather than generic instruction (Ning, 2016). To move students from "High" toward "Very High" levels of awareness, the academe should shift toward explicit instruction of metacognitive strategies (Pintrich, 2013). A practical suggestion is to implement a Strategy Evaluation Matrix (SEM), which encourages students to actively construct knowledge about the "what" (declarative), "how" (procedural), and "when and why" (conditional) of their learning strategies (Schraw, 1998).

Furthermore, findings suggest that traditional pedagogical models may be insufficient; instead, the academe should adopt Dynamic Assessment (DA) and Alternative Assessments. Unlike static testing, DA allows teachers to intervene during the assessment process, helping to reveal a learner's hidden potential and providing a more elaborate profile of their cognitive abilities (Birjandi 2013). Teachers are also encouraged to model metacognition through "think-aloud" protocols, sharing their own thinking processes to make implicit strategies visible to students (Pintrich, 2013). Finally, the finding that secondary learners report high awareness indicates a need for professional development that trains teachers to create "High-SRL" (Self-Regulated Learning) environments, ensuring they are equipped to facilitate the complex tasks and decision-making necessary for learners to effectively "drive their own brains" (Perry, 2006).

In terms of Regulation of Cognition scores of the learners as shown in Table 4 reveals a "High" level of metacognitive awareness across the secondary level, with Junior High School (JHS) learners reporting a total percentage of 81.04% and Senior High School (SHS) learners recording 75.69%. This component of metacognition is analyzed through five essential subdomains that allow learners to manage and control their thinking processes: planning, information management strategies, comprehension monitoring, debugging strategies, and evaluation (Limueco, 2019).

Table 4

Regulation of Cognition Scores of Learners

Grade Level	Planning	Information Management	Comprehension Monitoring	Debugging Strategies	Evaluation	Regulation of Cognition
	Max-7	Max-10	Max-7	Max-5	Max-6	Total (%)
Grade 7	5.77	7.50	5.45	3.57	4.52	76.43
Grade 8	6.39	7.80	6.00	4.23	4.91	84.25
Grade 9	6.30	7.23	5.98	4.32	4.98	83.38
Grade 10	5.57	7.31	5.96	4.49	4.41	80.21
Grade 11	4.91	6.30	4.96	4.17	3.78	70.11
Grade 12	5.90	7.06	5.85	4.38	4.48	80.13
JHS Learners	5.99±1.25	7.45±1.69	5.85±1.21	4.16±1.13	4.70±1.17	81.04
SHS Learners	5.41±1.54	6.69±1.89	5.41±1.47	4.28±1.04	4.28±1.43	75.69

Planning involves activities conducted before the learning process starts, such as setting specific goals, selecting appropriate strategies, and allocating time and cognitive resources (Limueco, 2019). JHS learners demonstrated a high capacity for this subdomain (5.99 ± 1.25 out of 7), while SHS learners scored slightly lower (5.41 ± 1.54), suggesting they are generally proactive in defining the nature of their tasks. Information Management Strategies refer to the skills and sequences used online during the learning process to handle and process information more efficiently, including organizing, elaborating, summarizing, and selective focusing (Rahayu, 2020). While both groups performed well, the higher standard deviation in SHS learners (±1.89) indicates that older students vary significantly in their ability to organize cognitive load (Deshmukh, 2025).

Comprehension Monitoring is the learner's ongoing awareness of understanding and task performance, often practiced through periodic self-testing and checking if goals are being met during execution (Limueco, 2019). Scores remained high for both JHS (5.85 ± 1.21) and SHS (5.41 ± 1.47), though the academic implication is that monitoring ability often develops slowly and may require direct instruction to move students toward "Very High" awareness (Schraw, 1998). Debugging Strategies are the specific actions taken to correct comprehension and performance errors when a learner realizes their current method is not effective. Interestingly, both groups scored similarly high in this area (JHS: 4.16, SHS: 4.28 out of 5), showing a robust awareness of how to "fix" confusion, such as by stopping and rereading unclear information (Telaumbanua, 2024). Finally, Evaluation refers to the analysis of performance and strategy effectiveness after a learning episode, where learners appraise their products and determine if they would do things differently next time (Limueco, 2019).

The findings across these subdomains carry significant implications for the academe. While the high averages are encouraging, the lack of uniformity indicated by the standard deviations suggests that a one-size-fits-all lecture style may leave struggling students behind (Zimmerman, 2002). Educators are encouraged to move beyond traditional instruction toward explicit strategy training, such as the use of regulatory checklists (RC) that prompt students to systematically plan, monitor, and evaluate their work (Schraw, 1998). Furthermore, the academe should recognize that academic emotions and task complexity influence these scores; creating a "Mastery Environment" that promotes self-reflection rather than just rote performance can help students internalize these skills, enabling them to effectively "drive their own brains" and become independent, lifelong learners (Ahmed, 2013).

In table 5, the final row showing the combined scores of Junior and Senior High School learners, indicates a "High" level of metacognitive awareness regarding their Knowledge of Cognition, with a total aggregate percentage of 75.50%. According to the framework in Table 1, this percentage falls within the "High" range ($68.75 < X \leq 81.25$), meaning these cognitive

habits are "much observed" across the secondary student population (Suarez, 2023). However, the presence of standard deviations (SD) across all subdomains, particularly the ± 1.74 in declarative knowledge, is a vital indicator for the academe that students are not a uniform group; this variability suggests a significant degree of heterogeneity, where a substantial subset of students may still struggle with low awareness despite the high overall average.

Table 5

Knowledge of Cognition Scores of Junior High and Senior High Learners

Category	Declarative Knowledge	Procedural Knowledge	Conditional Knowledge	Knowledge about Cognition
	Max-8	Max-4	Max-5	Total (%)
Junior High Learners	5.51±1.66	3.22±0.93	4.19±0.93	77.73
Senior High Learners	4.66±1.77	3.03±1.03	3.80±1.10	71.21
JHS and SHS Learners	5.22±1.74	3.16±0.97	4.12±0.99	75.50

Within this component, declarative knowledge (5.22 ± 1.74 out of 8) represents the factual information a learner possesses about their own skills, intellectual resources, and the specific factors that influence their academic performance (Rahayu, 2020). Because the high SD indicates that students' awareness of their own strengths and weaknesses varies widely, the academe should prioritize the use of Strategy Evaluation Matrices (SEMs). These instructional aids encourage students to move from a vague understanding to an explicit definition of their cognitive tools, helping them actively construct knowledge about their own skills (Schraw, 2001).

The subdomains of procedural and conditional knowledge further define how these learners manage their thinking. Procedural knowledge (3.16 ± 0.97 out of 4) reflects the learners' awareness of how to execute specific learning strategies, such as note-taking or problem-solving steps (Rahayu, 2020). Conditional knowledge (4.12 ± 0.99 out of 5) measures their understanding of when and why to apply those strategies to meet the changing demands of different tasks (Scraw, 1994). To enhance these areas, educators should employ teacher modeling and think-aloud protocols, in which instructors share their internal thinking processes to make implicit strategy use visible and show students how to selectively allocate their cognitive resources (Pintrich, 2013).

Ultimately, these findings carry broader implications for secondary education. Research indicates that metacognitive awareness can decline in higher grades due to increased exam-related anxiety and a shift toward rote test-taking (Radmehr, 2020). Therefore, the academe should transition from teacher-centered "lecture-style" instruction toward a "Mastery Environment" and Self-Regulated Learning (SRL) environments (Limueco, 2019). By using tools like the Metacognitive Awareness Inventory (MAI) for diagnostic screening, educators can identify struggling students and provide them with the explicit strategy training necessary

to move toward "Very High" levels of awareness, ensuring they become independent, lifelong learners capable of effectively "driving their own brains" (Sperling, 2002).

Table 6 shows combined data for Junior High School (JHS) and Senior High School (SHS) learners. The final row of Table 5 indicates a "High" level of Regulation of Cognition, evidenced by a total aggregate percentage of 79.06%. According to the interpretative framework, this percentage falls within the "High" awareness interval, signifying that these regulatory habits are "much observed" across the secondary student population (Suarez, 2023). However, the inclusion of standard deviations (SD) across all subdomains, most notably the ±1.79 in information management strategies, serves as a vital indicator for the academe that students are not a uniform group; this variability suggests a significant degree of heterogeneity, where a substantial subset of students may still struggle with self-regulation and require targeted intervention despite the high overall group average.

Table 6

Regulation of Cognition Scores of Junior and Senior High Learners

Category	Planning	Information Management	Comprehension Monitoring	Debugging Strategies	Evaluation	Regulation of Cognition
	Max-7	Max-10	Max-7	Max-5	Max-6	Total (%)
Junior High Learners	5.99±1.25	7.45±1.69	5.85±1.21	4.16±1.13	4.70±1.17	81.04
Senior High Learners	5.41±1.54	6.69±1.89	5.41±1.47	4.28±1.04	4.28±1.43	75.69
JHS and SHS Learners	5.80±1.38	7.19±1.79	5.70±1.32	4.20±1.10	4.51±1.29	79.06

This management of thinking is analyzed across five essential subdomains, beginning with planning (5.80 ± 1.38 out of 7), which involves setting goals and selecting appropriate strategies before learning. Information management strategies (7.19 ± 1.79 out of 10) refer to the skills used "on-line" to process information more efficiently, such as organizing, elaborating, summarizing, and selective focusing. Comprehension monitoring (5.70 ± 1.32 out of 7) represents the learner's periodic assessment of their own understanding and strategy use during execution, while debugging strategies (4.20 ± 1.10 out of 5) are the specific actions taken to correct comprehension or performance errors as they arise. Finally, evaluation (4.51 ± 1.29 out of 6) involves analyzing performance and strategy effectiveness after a learning episode is complete (Telaumbaua, 2024).

These findings carry significant implications for secondary education, suggesting that the academe should move toward explicit strategy instruction and the use of regulatory checklists (RCs) to help students achieve "Very High" awareness (Schraw, 2001). To address the lack of uniformity indicated by the standard deviations, educators are encouraged to implement teacher modeling and think-aloud protocols, in which instructors share their internal thinking processes to make implicit regulatory procedures visible to students (Pintrich, 2013). Furthermore, research suggests that traditional pedagogical models may be

insufficient; instead, the academe should adopt alternative assessments and flipped classroom models, which have been shown to significantly enhance a student's control over their cognition (Lao, 2022). Finally, schools should utilize the Metacognitive Awareness Inventory (MAI) as a diagnostic tool to identify individual students who fall into the "Low" or "Moderate" categories, allowing for targeted interventions that ensure all students learn to effectively "drive their own brains" and achieve academic success.

The overall metacognitive awareness of secondary learners, as measured by the 52-item Metacognitive Awareness Inventory (MAI) in Table 7, is characterized by a "High" level of awareness with a combined average score of 39.89 (76.71%). This total percentage signifies that metacognitive strategies are "much observed" across the secondary population, though a comparison of learner groups reveals a distinct downward trend as students' progress through higher grade levels (Stitzmann, 2011). Junior High School (JHS) learners demonstrate a higher awareness level (41.08; 78.99%) than Senior High School (SHS) learners (37.61; 72.32%), with Grade 11 students specifically falling into the "Medium" awareness level (66.72%). This decline in higher grades suggests that students may shift toward rote test-taking and experience increased exam-related anxiety as they prepare for higher education, moving away from deep self-regulatory habits toward mere "test-learning". Given that higher metacognitive awareness is a significant predictor of academic success, particularly in subjects like Mathematics, these findings imply a critical need for the academe to move beyond traditional teacher-centered lectures that may inadvertently suppress student agency (Deshmukh, 2025).

Table 7

Category	MAI Average Score	MAI Score Percentage
Grade 7	38.66	74.34
Grade 8	42.34	81.42
Grade 9	42.11	80.99
Grade 10	41.18	79.20
Grade 11	34.70	66.72
Grade 12	40.40	77.68
Junior High Learners	41.08	78.99
Senior High Learners	37.61	72.32
Combined	39.89	76.71

Educators are encouraged to use the MAI as a diagnostic screening tool to identify individual students who fall into the "Low" or "Medium" categories, enabling targeted interventions rather than generic instruction (Sperling, 2002). To move students toward a "Very High" level of awareness, the academe should prioritize explicit instruction in metacognitive strategies and adopt active learning models, such as the flipped classroom, which has been shown to significantly enhance students' knowledge and control over their own cognition (Limueco, 2019). Furthermore, a shift toward a "Mastery Environment," where effort and strategic application are rewarded over simple performance, can help mitigate negative

academic emotions, such as anxiety and boredom, that can incapacitate effortful information processing (Ahmen, 2013). Finally, investing in professional development to train teachers in creating Self-Regulated Learning (SRL) environments ensures they can effectively model metacognition through "think-aloud" protocols, making internal cognitive processes visible and helping all secondary learners master the ability to effectively "drive their own brains" (Perry, 2006).

The disparity between JHS and SHS learners' scores may imply developmental differences or variations in instructional approaches at the two educational levels. For JHS learners, the relatively higher scores could indicate that foundational metacognitive skills are well-addressed in their curriculum or teaching strategies. Conversely, the decline in scores among SHS learners might reflect the increasing complexity of tasks and the need for more advanced metacognitive strategies. Addressing this decline may require the integration of explicit metacognitive instruction and support tailored to the unique demands of SHS education. Implementing pedagogical training focused on developing students' metacognition has been shown to be effective in enhancing these skills (Perry et al., 2019).

Overall, while the data suggest that learners exhibit a high level of metacognitive awareness, the gaps from the maximum score across all groups indicate potential for improvement. Targeted pedagogical interventions that enhance metacognitive skills, such as fostering reflective practices, self-regulation strategies, and embedding metacognitive scaffolding within the curriculum, could maximize learners' metacognitive potential and academic success.

Conclusion

This study investigated the metacognitive awareness levels among junior high school (JHS) and senior high school (SHS) learners from a public high school, focusing on the two core domains of metacognition: Knowledge of Cognition and Regulation of Cognition.

Findings revealed that both JHS and SHS learners demonstrate moderately high Knowledge of Cognition, comprising Declarative, Procedural, and Conditional Knowledge. JHS learners showed higher average scores in Declarative Knowledge (M = 5.51) and Conditional Knowledge (M = 4.19), indicating a strong foundational understanding and a well-developed capacity to discern when and why to use learning strategies. However, Procedural Knowledge (M = 3.22) was only moderately developed, suggesting room for improvement in applying learned methods and processes.

SHS learners mirrored this pattern, with moderate scores in all three subdomains. Though they showed adequate levels of understanding, their scores were generally lower than those of their JHS counterparts. This indicates a possible decline in metacognitive engagement as learners progress to higher grade levels, possibly due to increased academic demands and reduced scaffolding.

Both groups demonstrated relative strengths in Planning, Comprehension Monitoring, and Debugging Strategies in the Regulation of Cognition domain. JHS learners exhibited particularly high competence in Planning (M = 5.99) and Information Management (M = 7.45), showcasing a proactive approach to learning organization and strategy. However, Evaluation (M = 4.70) and Debugging Strategies (M = 4.16) were moderately developed, revealing opportunities for instructional enhancement in assessing learning outcomes and correcting errors.

SHS learners followed a similar trend, with strong scores in Planning and Monitoring but weaker performance in Information Management and Evaluation. These results indicate a developmental inconsistency across metacognitive subdomains that may be attributed to curriculum structure, teacher support, or student motivation.

The aggregated data across both educational levels indicate that learners from the public high school possess a moderately high level of metacognitive awareness. Conditional Knowledge, Planning, and Debugging Strategies emerged as their strongest areas, suggesting that learners can adapt and self-correct during learning tasks. However, subdomains like Declarative Knowledge, Procedural Knowledge, Information Management, and Evaluation revealed consistent gaps from the maximum possible scores, emphasizing the need for targeted pedagogical interventions.

The analysis revealed that JHS learners outperformed SHS learners across several subdomains, potentially reflecting differences in instructional strategies or the increasing complexity of academic demands at the senior level. These results are aligned with existing literature (e.g., Weil et al., 2013; Ahmed et al., 2013), which indicates that metacognitive skills can fluctuate with age, motivation, and task difficulty.

To fully develop learners' metacognitive abilities, instructional practices must go beyond general awareness and explicitly teach strategies for planning, monitoring, evaluating, and managing learning processes. Interventions such as reflective journals, self-monitoring checklists, structured note-taking, and process-oriented instruction have been shown to foster significant improvements in metacognitive awareness (Zepeda et al., 2015; Donohoo, 2015; Teng, 2016).

The findings from this study lead to the conclusion that secondary learners generally possess a "High" level of metacognitive awareness (76.71%), indicating that self-regulatory habits are "much observed" across the population (Young, 2008). However, the data reveal a critical downward trend as students' progress through grade levels, with Junior High School (JHS) learners (78.99%) outperforming Senior High School (SHS) learners (72.32%). Literature suggests this decline is often linked to increased exam-related anxiety and a pedagogical shift toward rote, multiple-choice testing in higher grades, which can suppress deep strategic thinking (Deshmukh, 2025). Furthermore, the significant standard deviations, particularly in declarative knowledge (± 1.74) and information management (± 1.79), indicate

that learners are not a monolithic group; a substantial subset remains at "Medium" or "Low" awareness levels and is at risk of academic failure without targeted support (Suarez, 2023). Ultimately, while students enter secondary education with a strong foundation, the lack of uniformity and the observed regression in higher grades confirm that metacognitive skills do not always develop spontaneously and are sensitive to the academic environment (Sawhney, 2015).

To address these findings, the academe should adopt the Metacognitive Awareness Inventory (MAI) as a diagnostic screening tool to identify individual students who require direct intervention, rather than relying on generic, teacher-centered instruction (Baguin, 2024). Educators should prioritize explicit strategy instruction, integrating tools such as Strategy Evaluation Matrices (SEMs) and regulatory checklists to help students move from a vague understanding of their skills to "Very High" awareness (Akin, 2007). Furthermore, a shift toward active learning models, such as flipped classrooms and alternative or dynamic assessments, is recommended to empower students to take control of their own thinking processes (Lao, 2022). Teachers must also be trained to model metacognition through "think-aloud" protocols, making implicit cognitive processes visible to learners (Bugarin, 2022). Finally, creating a "Mastery Environment" that rewards effort and strategic application over simple performance can help mitigate negative academic emotions like boredom and anxiety, ensuring that all secondary learners master the ability to effectively "drive their own brains" (Deshmukh, 2025).

The cross-sectional nature of the study limits developmental interpretation, as differences between grade levels cannot be assumed to reflect longitudinal growth. In summary, learners at the public high school where the study was conducted exhibit promising levels of metacognitive awareness, with JHS learners showing slightly stronger performance overall. However, deliberate and structured instructional efforts are essential to bridge the gap between current performance and optimal metacognitive development. Educators can equip students with lifelong learning tools that enhance academic achievement and cognitive independence by embedding metacognitive skill-building in classroom instruction.

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