



Correlation between metacognitive awareness and student learning motivation in biology learning

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Abstract. This study is motivated by the importance of learning motivation and metacognitive awareness in supporting successful learning, particularly given the limited research on the relationship between these two variables among junior high school students. The study aims to analyze the relationship between students' learning motivation and metacognitive awareness in Biology learning. A quantitative approach with a correlational design was employed. The sample consisted of 124 students selected using a total sampling technique. Data were collected using a 52-item metacognitive awareness questionnaire adapted from the Metacognitive Awareness Inventory (MAI) and a 24-item learning motivation questionnaire based on Sardiman's indicators. Data analysis involved descriptive statistics and simple regression analysis using IBM SPSS Statistics. The results indicate that students' learning motivation falls into the high category (80.00%), while metacognitive awareness falls into the very high category (84.70%). Both instruments were found to be reliable, with Cronbach's Alpha values of 0.786 and 0.974, respectively. Regression analysis revealed a positive and significant relationship between learning motivation and metacognitive awareness, with a significance value of 0.000 ($p < 0.05$), a correlation coefficient (R) of 0.65, and a coefficient of determination (R^2) of 0.42. This indicates that learning motivation contributes 42% to students' metacognitive awareness, while the remaining 58% is influenced by factors outside the scope of this study. Thus, it can be concluded that there is a positive and significant relationship between learning motivation and students' metacognitive awareness in Biology learning. This finding implies that students with higher learning motivation tend to demonstrate better metacognitive awareness, particularly in planning, monitoring, and evaluating their learning processes. Therefore, strengthening students' learning motivation may be an important strategy to enhance their metacognitive skills in Biology learning environments.

Keywords: *Learning motivation, Metacognitive awareness, Biology learning*

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INTRODUCTION

Education is a conscious and planned effort to create a learning environment and process that enables students to play an active role in developing their potential. This potential encompasses spiritual strength, self-control, personality, intelligence, noble character, and various skills necessary for life in society (Aryadi & Kurniawati, 2025). Through the learning process, students are required not only to master knowledge but also to develop thinking skills that facilitate independent and lifelong learning. Therefore, effective instruction must actively engage students across cognitive, affective, and psychomotor domains to ensure educational goals are optimally achieved (Ramli, 2015).

However, the implementation of classroom instruction still faces various challenges. One frequently encountered issue is low student learning motivation. Learning motivation is a crucial factor determining student success in the learning process (Adha & Nirwana, 2022). Students with high motivation tend to be more active in learning activities, more persistent in completing tasks, and driven to achieve optimal academic performance (Amanah et al., 2023). Conversely, low motivation can lead to reduced student participation and negatively impact learning outcomes (Rangkuti et al., 2026). In addition to motivation, learning success is

influenced by students' ability to manage their own learning processes. In reality, many students struggle to plan learning activities, monitor their understanding of the material, and evaluate the learning strategies they employ. This situation indicates that students' metacognitive awareness is not yet optimally developed. Yet, metacognitive awareness plays a vital role in helping students understand material more deeply and enhancing their problem-solving skills (Jainiyah et al., 2023).

Metacognition refers to an individual's ability to be aware of, understand, and control their own thought processes. It involves "thinking about thinking," enabling individuals to understand how knowledge is acquired and utilized (Widiana, 2022). Metacognitive awareness plays a role in improving the quality of thought processes, as it allows students to reflect on the steps taken to solve a problem (Patmaningrum, 2021). In a learning context, this ability enables students to set learning goals, select appropriate strategies, monitor their progress, and evaluate the outcomes achieved. Strong metacognitive awareness can help students become more independent learners by allowing them to recognize their own strengths and weaknesses throughout the learning process (Fitria et al., 2020).

Metacognitive awareness also contributes to the development of higher-order thinking skills. Students with strong metacognitive awareness tend to better understand the learning methods that best suit their individual needs and characteristics, and they are more adept at selecting appropriate strategies to complete various academic tasks (Yuliasanti & Wati, 2025). Furthermore, awareness of one's own thinking processes can enhance student participation in learning, as students gain a clearer understanding of the objectives and steps required to achieve optimal learning outcomes (Adnyana & Yudaparmita, 2023). The development of metacognitive awareness does not occur automatically; rather, it requires cultivation through carefully designed learning experiences, with teachers playing a crucial role in creating an environment that encourages students to plan, monitor, and evaluate their own thinking processes (Livingston, 1997).

As a crucial aspect of learning, learning motivation refers to a student's inclination to engage in learning activities with the aim of achieving optimal results (Rahmadania & Aly, 2023). Motivation is understood as the drive that compels individuals to complete learning tasks with enthusiasm and perseverance to achieve established goals (Basompe & Soetjningsih, 2023), as well as an internal force that spurs specific actions aimed at fulfilling desired objectives (Setianawati et al., 2025). According to Adan (2023), learning motivation acts as a factor that drives students to exert their best effort during the learning process. It relates not only to the drive for academic achievement but also influences students' attitudes and behaviors during instruction. Simamora & Simamora (2022) explain that learning motivation can stem from both intrinsic and extrinsic factors, which mutually support the creation of optimal learning conditions. Instruction perceived as relevant and meaningful to students' lives tends to boost their learning drive and engagement in educational activities (Jainiyah et al., 2023). Furthermore, learning motivation is proven to contribute to academic success and can be enhanced through the implementation of engaging learning models tailored to the characteristics of the learners (Harahap et al., 2021; Nursalma & Pujiastuti, 2023).

On the other hand, learning motivation and metacognitive awareness are interconnected components that support a successful learning process. Learning motivation acts as a driving force that directs students toward achieving their learning goals, while metacognitive awareness assists them in managing, monitoring, and evaluating the thinking processes employed during learning. High learning motivation can foster student autonomy, leading them to take a more active role in organizing learning strategies tailored to their specific needs (Setianawati et al., 2025). Conversely, the application of metacognitive strategies is more effective when underpinned by strong learning motivation (Albalhareth & Alasmari, 2023). Several studies have also demonstrated a positive relationship between motivation and the

development of students' metacognitive awareness (Dessie et al., 2024; Keo et al., 2023).

The link between learning motivation and metacognitive awareness is further supported by the findings of various previous studies. Several studies indicate a positive and significant relationship between these two variables, where students with high learning motivation tend to be more capable of independently planning, monitoring, and evaluating their learning processes. However, other studies report conflicting findings, meaning no consistent conclusion regarding the relationship between these variables has yet been reached. These divergent results suggest that the relationship between learning motivation and metacognition requires further investigation across different contexts and student characteristics.

Given this background, further research is needed to examine the relationship between metacognitive awareness and student learning motivation, particularly in the context of Biology instruction at the junior high school level. Therefore, this study aims to analyze the relationship between metacognitive awareness and student learning motivation in Biology.

This study contributes novelty by analyzing the correlation between students' metacognitive awareness and learning motivation in Biology learning at the junior high school level, which has been limited in previous studies, particularly in the Indonesian educational context.

METHOD

This study employs a quantitative approach with a correlational design, aiming to analyze the relationship between students' metacognitive awareness and learning motivation without administering any specific intervention to the research subjects. The study was conducted on April 9, 2026, at SMP PGRI Kramatwatu, Serang Regency, Banten, following the receipt of permission from the school authorities.

The study population consisted of all students from classes VII A, VII B, VIII B, and VIII C at SMP PGRI Kramatwatu. A total sampling technique was used, meaning that all members of the population were included as research samples. Therefore, the entire population comprising 124 students was involved in this study as the sample, since the number of population members was relatively small and accessible for data collection. The research instruments consisted of two questionnaires. The first questionnaire measured metacognitive awareness and was adapted from the Metacognitive Awareness Inventory (MAI), featuring 52 items covering the aspects of planning, monitoring, and evaluating. The second questionnaire assessed learning motivation and was developed based on indicators by Sardiman (2018), encompassing persistence in learning, tenacity in facing difficulties, interest in learning, learning independence, and problem-solving ability.

Data collection was carried out by distributing the questionnaires to all research respondents. The obtained data were subsequently analyzed using IBM SPSS Statistics. Data analysis involved descriptive analysis to determine the levels of students' metacognitive awareness and learning motivation based on mean scores and percentages. The analysis of the relationship between variables was conducted using the Spearman Rank correlation test. The analysis results were then interpreted to draw conclusions for the study.

RESULTS AND DISCUSSION

Results

This study involved 124 students from SMP PGRI Kramatwatu, comprising 35 students from class VII A, 33 from class VII B, 26 from class VIII B, and 30 from class VIII C. All students across these four classes served as research respondents, selected using a total sampling technique.

Based on the questionnaire analysis, the average learning motivation of SMP PGRI Kramatwatu students was 80.00%, placing it in the high category. Class VIII B recorded the

highest learning motivation at 82.48%, while class VII A recorded the lowest at 78.62%. This indicates that the majority of students possess good learning motivation, reflected in their persistence in completing assignments, ability to defend their opinions, and active engagement in the learning process.

Table 1. Students' learning motivation across classes

Class	Students (n)	Motivation (%)	Category
VII A	35	78.62	High
VII B	33	79.50	High
VIII B	26	82.48	High
VIII C	30	79.90	High
Total	124	80.00	High

Based on Table 1, it can be observed that students' learning motivation is generally high across all classes. Although there are slight differences between classes, all scores remain within the high category. These results indicate that students are actively engaged in learning activities, particularly in completing tasks and expressing opinions during classroom interactions.

The analysis also revealed that students' metacognitive awareness achieved an average score of 84.70%, falling into the very high category. Class VII A achieved the highest score at 87.45%, whereas Class VIII C recorded the lowest at 82.93%. These results demonstrate that the students are capable of planning, monitoring, and evaluating their own learning processes.

Table 2. Students' metacognitive awareness across classes

Class	Students (n)	Metacognitive Awareness (%)	Category
VII A	35	87.45	Very High
VII B	33	84.00	Very High
VIII B	26	84.42	Very High
VIII C	30	82.93	Very High
Total	124	84.70	Very High

Based on Table 2, students' metacognitive awareness shows relatively high scores across all classes, with VII A obtaining the highest score (87.45%) and VIII C the lowest score (82.93%). Meanwhile, VII B and VIII B show similar high levels of metacognitive awareness at 84.00% and 84.42%, respectively. The overall mean score of 84.70% indicates that students' metacognitive awareness is categorized as very high across the sample.

Table 1. Simple Regression Test Results

R	R Square	Sig.
0,65	0,42	0,000

$$Y = 20,1 + 0,60X$$

Based on these results, a significance value of 0.000 ($p < 0.05$) indicates a significant relationship between students' learning motivation and metacognitive awareness. The correlation coefficient (R) of 0.65 indicates a strong, positive relationship between the two variables. Meanwhile, the coefficient of determination (R^2) of 0.42 shows that learning motivation contributes 42% to students' metacognitive awareness, while the remaining 58% is influenced by factors outside the scope of the study.

The regression equation $Y = 20.1 + 0.60X$ indicates that for every one-unit increase in learning motivation, students' metacognitive awareness increases by 0.60.

Discussion

The regression analysis results indicate a positive and significant relationship between students' learning motivation and metacognitive awareness. This is evidenced by a significance value of 0.000 ($p < 0.05$) and a correlation coefficient (R) of 0.65. The coefficient of determination (R^2) of 0.42 reveals that learning motivation contributes 42% to students' metacognitive awareness, while the remaining 58% is influenced by factors outside the scope of this study. The resulting regression equation is $Y = 20.1 + 0.60X$.

The findings show that students' learning motivation falls into the high category (80.00%), while metacognitive awareness falls into the very high category (84.70%). This indicates that, in general, students possess a strong drive to learn and well-developed cognitive regulation abilities within the learning process. High learning motivation is reflected in students' persistence in completing assignments, their ability to defend their opinions, and their active engagement in learning. This aligns with Adan (2023), who states that learning motivation is a crucial factor driving students to achieve optimal learning outcomes through active participation in the learning process. Furthermore, Jannah et al. (2021) emphasize that high motivation is linked to the consistency of students' efforts in completing academic tasks.

Meanwhile, the very high level of metacognitive awareness indicates that students can plan, monitor, and evaluate their own learning activities. Livingston (1997) defines metacognition as an individual's awareness of their own thought processes, enabling them to become independent learners. This is supported by Patmaningrum (2021), who explains that metacognition plays a role in enhancing the quality of thought processes through reflection on problem-solving steps. Although both variables fall into the high and very high categories, the regression test results demonstrate that learning motivation has a positive and significant relationship with students' metacognitive awareness. This indicates that the higher a student's learning motivation, the higher their level of metacognitive awareness.

This aligns with the findings of Acosta-Gonzaga and Ramirez-Arellano (2021), who state that motivation and metacognition can be directly linked, particularly when students possess a strong internal drive to achieve learning goals. High motivation fosters deeper cognitive engagement, thereby leading to enhanced metacognitive awareness (Marantika, 2021). Furthermore, Dessie et al. (2024) explain that metacognitive awareness can develop through students' active engagement in learning processes that demand critical and reflective thinking. In this regard, learning motivation acts as a primary driver, encouraging students to be more consistent in employing high-level thinking strategies.

The study's findings also indicate that learning motivation contributes 42% to metacognitive awareness. This suggests that, in addition to motivation, 58% of the influence on students' metacognitive awareness stems from other factors, such as learning strategies, the learning environment, and various psychological elements. According to Van Loon et al. (2021), the development of metacognition is significantly influenced by teacher instruction that explicitly fosters metacognitive awareness during lessons. Thus, while learning motivation makes a substantial contribution, the role of the teacher and the design of instruction remain crucial factors in optimizing students' metacognitive awareness (Amelia & Hajar, 2024).

Additionally, Shin et al. (2019) emphasize that metacognition can also be influenced by mediating factors such as self-efficacy, which strengthens the relationship between motivation and learning outcomes. This demonstrates that the link between motivation and metacognition is complex and involves several supporting variables (Fariah et al., 2024). In the context of biology education, these results indicate that high learning motivation can support the enhancement of students' metacognitive awareness when grasping complex concepts.

Biology lessons requiring analytical skills—such as those covering living systems and ecosystems—necessitate active student engagement in managing their own thought processes (Mahardita & Pratama, 2022).

This relationship can be explained by the fact that students with higher learning motivation tend to show greater persistence, attention, and willingness to engage in cognitive regulation processes such as planning, monitoring, and evaluating their understanding (Anthonysamy, 2021). As motivation increases, students are more likely to actively reflect on their learning strategies and adjust them when facing difficulties, which in turn strengthens their metacognitive awareness (Antika et al., 2023).

According to Arianto and Hanif (2024), instruction based on self-regulated learning can significantly boost students' metacognitive awareness by providing opportunities for them to independently plan, monitor, and evaluate their learning processes. Therefore, biology teachers need to design instruction that not only fosters motivation but also guides students toward developing metacognitive strategies (Andini & Azizah, 2021). Overall, the findings of this study demonstrate a positive and significant relationship between learning motivation and students' metacognitive awareness. This implies that increasing learning motivation can serve as a key strategy for enhancing students' metacognitive awareness in biology learning.

CONCLUSION

Based on the research results and data analysis, it can be concluded that there is a positive and significant relationship between students' learning motivation and their metacognitive awareness in Biology learning. This is evidenced by a significance value of 0.000 ($p < 0.05$) and a correlation coefficient (R) of 0.65, indicating a strong relationship between the two variables. The coefficient of determination (R^2) of 0.42 indicates that learning motivation contributes 42% to students' metacognitive awareness, while the remaining 58% is influenced by factors outside the scope of this study. The resulting regression equation is $Y = 20.1 + 0.60X$. Furthermore, students' learning motivation falls into the high category (80.00%), while their metacognitive awareness falls into the very high category (84.70%). This indicates that students possess good learning motivation and developed cognitive regulation abilities within the learning process. Thus, it can be concluded that higher student learning motivation corresponds to higher metacognitive awareness in Biology learning. Therefore, enhancing learning motivation can serve as a key strategy for developing students' metacognitive awareness. This finding implies that teachers should design learning activities that actively foster students' motivation, such as inquiry-based or problem-based learning, to support the development of metacognitive skills during Biology instruction. Future research is recommended to explore other factors that may influence metacognitive awareness, such as learning strategies, self-efficacy, or classroom environment, using different research designs or larger populations.

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