

## Correlation Studies: The Relationship of Metacognitive Skills and Cognitive Learning Outcomes

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**Abstract:** Learning basic natural sciences is not only about understanding the universe, but also about developing the trained, critical and analytical thinking needed to succeed in various life contexts. Material in basic natural science learning often involves understanding complex concepts and abstract thought processes, so good metacognitive skills are needed in students. Well-developed metacognitive skills are very important so that students can understand basic concepts and principles well so that they are expected to have a significant correlation with student cognitive learning outcomes. The research uses correlational research methods. The variable relationship that will be looked at in the research is the relationship between metacognitive skills and students' cognitive learning outcomes in learning using the Reading Concept Mapping-Student Team Achievement Division (Remap-STAD) model. The subjects in this research were students who were taking basic natural science courses. Metacognitive skills are measured using an achievement test integrated with cognitive learning outcomes questions. The data analysis used in the research is correlation analysis and regression analysis. The research results show that there is a relationship between metacognitive skills and students' cognitive learning outcomes in learning using the Reading Concept-Student Team Achievement Divisions (ReMap-STAD) model. The correlation coefficient ( $r$ ) value of metacognitive skills with cognitive learning outcomes is 0.945 (very high). The direction of the relationship between metacognitive skills and cognitive learning outcomes is a positive relationship. The coefficient of determination ( $r^2$ ) is 0.893, so it can be explained that the variability in students' cognitive learning outcomes is determined by 89.3% by metacognitive skills. The regression significance value proves that the regression line equation can be used for predictions. The regression line equation for the relationship between metacognitive skills and cognitive learning outcomes using the Reading Concept-Student Team Achievement Divisions (ReMap-STAD) model is  $\hat{Y} = 1.246 + 1.058X$ .

**Keywords:** Cognitive Learning Outcomes, Correlational Studies, Metacognitive Skills, ReMap-STAD Model.

## INTRODUCTION

The study of basic natural sciences brings broad benefits to students in a deep understanding of the basic principles of the universe. Through this course, students gain a solid understanding of basic concepts such as physics, chemistry, biology, and mathematics. Physics allows them to understand the behavior of the universe from subatomic particles to large structures such as galaxies, while chemistry opens up insights into the reactions and interactions of matter. The study of biology introduces the complexity of life from the cellular to the organismal level, while mathematics provides powerful analytical tools for

understanding natural phenomena. At a deeper level, learning basic natural sciences introduces students to the scientific method, teaching them how to think critically, analyze data, and construct arguments based on empirical evidence. Additionally, it also cultivates practical skills such as problem-solving, abstract thinking, and communication skills which are vital in various career fields. Overall, learning basic natural sciences in higher education is not only about understanding the universe, but also about forming the trained, critical, and analytical thinking needed to succeed in various life contexts. Material in basic natural science learning often involves understanding complex concepts and abstract thought processes, so good

metacognitive skills are needed in students. Strong metacognitive skills are very important so that students can understand basic concepts and principles well.

This metacognitive ability involves self-understanding of one's thought processes, such as the ability to plan, monitor, and evaluate their understanding of the material studied. With good metacognitive skills, students can be more effective in organizing their learning strategies, identifying the difficulties they face, and adjusting their approach to understanding complex concepts in the basic natural sciences. Thus, metacognitive skills help students to become more independent learners and deepen their understanding of basic science.

Metacognition, on the one hand, refers to “the knowledge a person has about the products of his own cognitive processes, or other things related to them,” and on the other hand, “to the active monitoring and consequent organization and organization of these processes in relation to cognitive objects or data on which they act (Flavel, 1976; Rivas et. al., 2022). Metacognition and critical thinking are critical to academic success and learning at the college level, as assessed by progress checks, to inform curriculum development and efforts to ensure the learning progress of all students. Process skills in learning will be more meaningful when students' critical thinking skills and metacognitive skills develop optimally (Naimnule & Corebima, 2018).

Metacognitive skills are skills that are considered valuable for students to have (Bae & Kwon, 2019). Education in the 21st century requires students to be able to access their understanding accurately (Miller, 2017). Metacognition is an important skill for students to have because it is a high-level thinking process that involves active control of students' cognitive processes such as planning, predicting, testing, perfecting, examining, and evaluating so that metacognition can reflect students' understanding of what will be learned (Yusnaeni et al., 2020). The use of metacognitive skills makes students aware of their weaknesses and strengths in learning so they can know what to do and monitor the actions they have taken (Az-Zahra et. al., 2021).

Schraw and Dennison (1994) define metacognition as the ability to reflect, understand, and control learning. According to Zimmerman (1990), metacognition is part of the

self-directed learning process and includes planning, goal setting, organization, self-monitoring, and self-evaluation at various points during the knowledge acquisition process. Metacognition is a concept that has been used to refer to various epistemological processes. “Metacognition” basically means cognition about cognition; that is, it refers to the second level of cognition: thinking about thinking, knowledge about knowledge, or reflection about action. So, if cognition involves perception, understanding, remembering, and so on, then metacognition involves thinking about perception, understanding, remembering oneself, etc. These various notions of cognition can be labelled metaperception, “metacomprehension,” and “metamemory,” with “metacognition” remaining the higher term.

Lack of metacognitive abilities causes students not only to be less successful at the academic level but also hinders the independent learning needed to become lifelong learners who are able to adapt to any learning situation. Metacognitive skills are needed by students to reflect on what is done and needed to carry out the tasks given, use, and choose learning strategies that support success in their learning (Muhlisin, et.al, 2016).

It is hoped that a good metacognitive skill regulation mechanism will have a significant correlation with student cognitive learning outcomes. Cognitive learning outcomes are results or achievements that occur in the learning process related to individual cognitive abilities, such as understanding, reasoning, memory, and application of concepts. More specifically, cognitive learning outcomes include an individual's ability to understand new information, connect it with previously held knowledge, and then apply this knowledge in relevant situations. This process involves various mental activities, such as observation, analysis, synthesis, and evaluation. Cognitive learning outcomes also include an individual's ability to solve problems, make the right decisions, and develop critical and creative thinking skills. Thus, cognitive learning outcomes are the main indicator of the extent to which individuals have understood the learning material and can apply it in real-life contexts.

Students' cognitive learning outcomes involve several important components that contribute to the understanding, use, and application of knowledge and skills. First, factual

knowledge is the foundation, which includes facts, concepts, principles, and theories obtained through direct experience or learning. Then, cognitive skills become another important aspect, including the ability to think critically, analytically, synthetically, and evaluatively, which allows students to understand, analyze and synthesize information effectively. In addition, learning strategies and problem solving are inseparable components, which include students' abilities to plan, manage time, and solve tasks or problems systematically. Apart from that, memory also plays an important role, both in retaining information in the short and long term and in retrieving relevant information when needed. Lastly, motivation and emotions also influence cognitive learning outcomes, where students who are intrinsically motivated tend to be more enthusiastic about learning and achieve deeper understanding. Overall, these components interact with each other and contribute to the formation of effective cognitive learning outcomes for students.

Many research results reveal that there is a relationship between metacognitive skills and cognitive learning outcomes (Singh, 2012; Ardila, 2013; Fauziyah, et al., 2013; Arifin, et al., 2013; Kusuma & Nisa, 2018; Milama, et al., 2019; Priantiningtias & Azizah, 2021). In other words, cognitive learning outcomes will increase when metacognitive skills increase. Other research that also examines the relationship between metacognitive skills and learning outcomes is that by Kusuma & Nisa (2018), which reports that metacognitive skills are correlated with cognitive learning outcomes with the regression equation  $Y = 1.2029X - 29.395$  and a contribution of 81.08%. Apart from that, the results of research conducted by Nongtodu & Bhutia (2017) and Onyekuru & Njoku (2015) also show a positive correlation between metacognitive skills and cognitive learning outcomes. Apart from that, metacognitive skills, as reported by Kristen et al. (2015), have a greater contribution to cognitive learning outcomes, namely 61.93%, compared to the contribution of scientific attitudes of 9.49%. Furthermore, research conducted by Siswati and Corebima (2017) found a positive correlation between metacognitive skills and concept acquisition.

Metacognitive skills are important for training students because they help monitor cognitive activities, such as planning, monitoring, and evaluating the learning process

(Ramadhanti, et.al, 2019). Practicing metacognitive skills can be done using learning strategies such as mind maps. This strategy can help to build knowledge and increase students' interest in independent learning (Ren, et.al, 2019). Students who have good metacognitive skills will be successful in learning because it will develop them into independent learners who can control their cognitive processes, including their thinking skills (Schraw & Dennison, 1994). Based on this explanation, the aim of this research is to determine the relationship between metacognitive skills and the cognitive learning outcomes of students in basic natural science lectures.

## METHODS

The research uses correlational research methods. Correlational research is research used to describe the relationships that exist between variables (Hodge, 2020; Jamieson, et.al, 2023). The relationship that will be seen in the research is the relationship between metacognitive skills and students' cognitive learning outcomes in learning using the Reading Concept Mapping-Student Team Achievement Division (Remap-STAD) model. The subjects in this research were students who were taking basic natural science courses. Metacognitive skills are measured using an achievement test integrated with cognitive learning outcomes questions. The metacognitive skills rubric consists of 7 scales (0–7), referring to Corebima (2009), used to determine metacognitive skills scores. Cognitive learning outcomes are measured using tests and assessed using a cognitive learning outcomes rubric (Wei, et.al, 2021; Krebs, et.al, 2022). The data analysis used in the research is correlation analysis and regression analysis. Correlation analysis uses Pearson Product Moment to determine the closeness of the relationship between variables (Sedgwick, 2012; Puth, et.al, 2014). The correlation coefficient between metacognitive skills and cognitive learning outcomes can be calculated using the following formula,

$$r = \frac{n \sum x_i y_i - \sum x_i \sum y_i}{\sqrt{\{n \sum x_i^2 - (\sum x_i)^2\} \{n \sum y_i^2 - (\sum y_i)^2\}}} \dots (1)$$

To find out how much the independent variable contributes to the dependent variable, then proceed with calculating the coefficient of determination. The coefficient of determination

(r<sup>2</sup>) is calculated by squaring the correlation coefficient (r) and then multiplying by 100%. Regression analysis is used to make predictions using predictor variable and response variable data (Weisberg, 2014; Lewis-beck & Lewis-beck, 2015). To find out the value of the regression coefficient and the regression line equation, regression analysis was carried out using simple linear regression (simple linear regression). Regression analysis is a statistical technique for investigating and modelling relationships between variables (Montgomery, et. al, 2015; James, et.al, 2023). The regression equation used is,

$$\hat{Y} = a + bX \quad \dots (2)$$

Before being analyzed using simple regression analysis, the data was first analyzed for normal distribution and the linearity relationship pattern of the data as a classic assumption test for simple

regression analysis. Data normality distribution test analysis was carried out using Shapiro Wilk analysis. The normality test using Shapiro Wilk tests how well the distribution of research data fits the normal curve if the sample size is less than 50 (Razali, 2011; Siebert, et.al, 2018; González-Estrada & Cosmes, 2019). The linearity test was carried out to determine the pattern of relationship between metacognitive skills and cognitive learning outcomes. One of the linearity tests that can be used is the F test (Kusuma & Nurmawanti, 2023).

## FINDINGS AND DISCUSSION

### Findings

The research results are explained in detail, starting with the results of testing the classic assumptions of research data, namely normality and linearity of the data. The results of the data normality test can be seen in Table 1 below;

Table 1. Summary of Data Normality Test Results

Variables	Shapiro-Wilk		
	Statistic	Df	Sig.
Metacognitive_Skills	.947	42	.051
Learning_Outcomes	.971	42	.361

Based on the summary of the results of the research data normality test using the Shapiro-Wilk test in Table 1, it can be seen that the metacognitive skills data is normally distributed with a significance value of 0.051, which is greater than the predetermined significance level of 0.05. Data on cognitive learning outcomes is

also normally distributed with a significance value of 0.361, which is greater than the predetermined significance level of 0.05. Apart from the normality test, a linearity test was also carried out on the research data. The results of the linearity test can be seen in Table 2 below.

Table 2. Summary of Data Linearity Test Results

			Sum of Squares	df	Mean Square	F	Sig.
Learning_Outcomes * Metacognitive_Skills	Between	(Combined)	3194.071	18	177.448	26.190	.000
	Groups	Linearity	2990.473	1	2990.473	441.375	.000
		Deviation from Linearity	203.599	17	11.976	1.768	.101
Within Groups			155.833	23	6.775		
Total			3349.905	41			

Based on the results of the linearity test, it is known that the significance value of the linearity of learning outcomes data with metacognitive skills is  $0.00 < 0.05$ , so it can be concluded that the relationship pattern between metacognitive skills and cognitive learning

outcomes has a linear relationship. The linear relationship pattern can also be seen from the significance value of deviation from linearity. If the significance value of deviation from linearity is greater than the significance level, then the relationship pattern between two variables is said

to be linear. Based on the results of the analysis, it is known that the significance value of deviation from linearity is  $0.101 > 0.05$ , so it can be concluded that the pattern of the relationship

between metacognitive skills and cognitive learning outcomes has a linear relationship. The next results explain the regression coefficient values, which can be seen in Table 3.

Table 3. Regression Coefficient Analysis Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2990.473	1	2990.473	332.800	.000 <sup>b</sup>
	Residual	359.432	40	8.986		
	Total	3349.905	41			

Based on the results of the analysis in Table 3, it can be seen that the regression significance value is  $0.00 < 0.05$  so,  $H_0$  states that there is no relationship between metacognitive skills and cognitive learning outcomes of students using the Reading Concept Mapping-Student Team Achievement Division (Remap-STAD) model was rejected, and  $H_a$ , who stated that there was a relationship between metacognitive skills and students' cognitive learning outcomes in learning using the Reading Concept Mapping-Student Team Achievement Division (Remap-STAD) model, was accepted. This regression significance value is also used to determine whether the regression line equation

can be used for prediction or not. If the regression significance value is  $<$  the specified significance level, then the regression line equation can be used for prediction. Based on the analysis results, it can be seen that the regression significance value is  $0.00 < 0.05$ , so it can also be concluded that the regression line equation can be used for prediction. The correlation coefficient value ( $r$ ), which explains the close relationship between metacognitive skill variables and cognitive learning outcomes, and the coefficient of determination ( $r^2$ ), which explains the magnitude of the influence of predictor variables on response variables, can be seen in Table 4.

Table 4. Correlation Coefficient and Determination Coefficient Values of Metacognitive Skills with Cognitive Learning Outcomes

	Measures of Association			
	R	R Squared	Eta	Eta Squared
Cognitive_Learning_Outcomes	.945	.893	.976	.953
* Metacognitive_Skills				

Based on Table 4, it can be seen that the correlation coefficient ( $r$ ) value of metacognitive skills with cognitive learning outcomes is 0.945 (very high). The direction of the relationship between metacognitive skills and cognitive learning outcomes is a positive. The coefficient of determination ( $r^2$ ) is 0.893, so it can be

explained that the variability in students' cognitive learning outcomes is determined by 89.3% of metacognitive skills. The pattern of the relationship between metacognitive skills and cognitive learning outcomes based on scatterplot analysis can be seen in Figure 1 below.

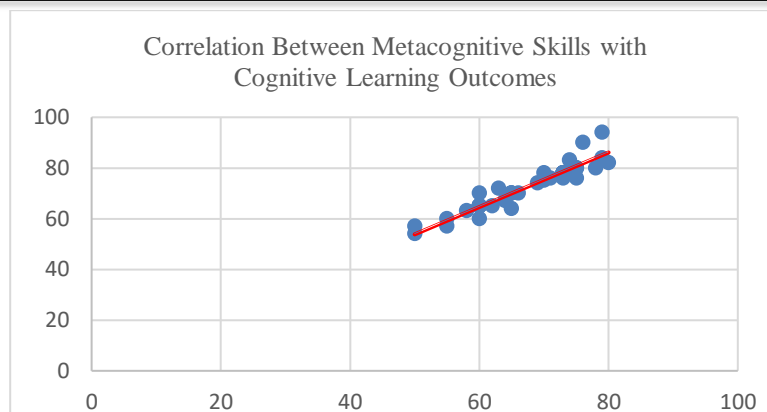


Figure 1. Model of the Relationship between Metacognitive Skills and Cognitive Learning Outcomes

Based on Figure 1, it can be seen that the relationship between metacognitive skills and cognitive learning outcomes forms a linear positive relationship. An illustration of the

regression line equation of the relationship between metacognitive skills and cognitive learning outcomes can be seen in Table 5 below.

Table 5. Regression line equation for the relationship between metacognitive skills and cognitive learning outcomes

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	1.246	3.903		.319	.751
Metacognitive_Skills	1.058	.058	.945	18.243	.000

Based on Table 5, it can be seen that the intercept of the regression line equation is 1.246. The slope value (slope of the line) is 1.058. This slope value means that for every 1 increase in the metacognitive skills variable, the value of the cognitive learning outcomes variable will increase by 1.246. The regression line equation for the relationship between metacognitive skills and students' learning outcomes in studying basic physical sciences using the Reading-Concept Mapping Student Team Achievement Division (ReMap-STAD) learning model is  $\hat{Y} = 1.246 + 1.058X$ .

**Discussion**

Based on the results of data analysis, it is known that there is a significant relationship between metacognitive skills and student learning outcomes in studying basic natural sciences with a correlation coefficient of 0.859, which means that the relationship between metacognitive skills and student cognitive learning outcomes is very high (Jackson, 2009; Ravid, 2011). These results suggest that learners who self-regulate and develop effective strategies

such as planning, information management, monitoring, debugging, and evaluation require a sophisticated understanding of their own cognitive processes. Metacognitive skills refer to conscious control processes such as planning, monitoring processing progress, allocating effort, using strategies, and regulating cognition (Nongtodu & Bhutia, 2017). Efforts to improve a person's cognitive skills need to be supported by improving metacognitive skills (Adnan & Bahri, 2018). Siswati et.al (2020) explained that metacognitive skills have a significant relationship with students' cognitive learning outcomes.

Kristiani, et al., (2015) had a greater contribution to cognitive learning outcomes, namely 61.93%. Furthermore, research conducted by Siswati & Corebima (2017) found a positive correlation between metacognitive skills and concept acquisition. Metacognitive skills are associated with increased cognitive learning outcomes because students are more aware of their thinking processes, so they try as hard as possible to complete each task as well as possible (Onyekuru & Njoku, 2015). In addition,

metacognitive skills also play a key role in various cognitive activities such as understanding, attention, communication, problem-solving, and memory (Howard, 2004; Ohtani & Hisasaka, 2018).

The existence of a very significant relationship with a correlation coefficient ( $r$ ) of 0.945 between metacognitive skills and cognitive learning outcomes in this research cannot be separated from the role of the learning strategies implemented. The Remap-STAD (Reading Concept Mapping-Student Team Achievement Divisions) learning strategy combines reading activities and constructing concept maps with the syntax of the STAD learning strategy. The STAD learning strategy is cooperative learning that is student-centered, thus making students play a more active role, interacting with fellow students, and participating in various investigative and problem-solving activities (Arends, 2008). Remap-STAD is a form of Remap-coople (Reading Concept Mapping-Cooperative Learning) (Zubaidah, 2014; Ramadhan, et.al, 2016). Thus, it is natural that this series of activities has an influence on improving learning outcomes (Darwis, et.al, 2021; Adawiyah, et.al, 2021) and empowering metacognitive skills (Kusuma & Busyairi, 2023).

Metacognitive skills, which include awareness of thought processes and the ability to organize and monitor learning, greatly influence students' cognitive learning outcomes in several different ways (Van Der Stel, et.al, 2014). Metacognitive skills help students choose the right learning strategy for a particular task or material. For example, a student who realizes that he has difficulty understanding a concept may choose to use more active learning methods, such as rereading material, taking notes, or discussing with classmates (Amin & Sukestiyarno, 2015). This ability to choose effective learning strategies can increase students' understanding of the material.

A good planning mechanism in metacognition has a big impact on student learning outcomes (Coskun, 2018). Metacognition is the ability to understand and organize the learning process and understanding of subject matter. By having a good planning mechanism in metacognition, students can effectively manage the time, resources and learning strategies they use (Jaleel, 2016). They can actively monitor their understanding of the material, identify weaknesses, and adjust their

learning approach according to their needs (Schuster, et.al, 2020). Thus, they can increase the efficiency and effectiveness of their learning. Additionally, through careful planning, students can also develop better problem-solving, creativity and reasoning skills, all of which are important for achieving better learning outcomes. Good planning mechanisms in metacognition not only influence students' academic achievements, but also prepare them to become independent and successful learners in various areas of life (Kyriakides, et.al, 2020).

Self-monitoring mechanisms in metacognitive skills play a key role in influencing students' cognitive learning outcomes. By understanding and controlling their own mental processes, students can be more effective in managing the way they learn, understand, and remember information (Veenman, 2015; Avargil, et.al, 2018). Metacognitive self-monitoring involves awareness of the most effective learning strategies, as well as the ability to assess their own understanding of the material (Veenman, 2015; Craig, et.al, 2020). Through careful self-monitoring, students can identify areas where they need more understanding or help and adjust their learning approach accordingly. This mechanism helps increase learning efficiency, improve information retention, and improve problem-solving abilities and understanding of concepts (Abdullah, et.al, 2017). Awareness of their own learning process also allows students to develop independence in learning, which is a very valuable skill in achieving optimal learning outcomes. Thus, the self-monitoring mechanism in metacognitive skills is not only about improving understanding, but also about increasing overall learning effectiveness (Veenman, 2015; Abdullah, et.al, 2017; Craig, et.al, 2020).

The self-evaluation mechanism in metacognitive skills is very important in influencing students' cognitive learning outcomes. Metacognition includes understanding and managing our own thought processes, including awareness of effective learning strategies and the ability to evaluate the effectiveness of those strategies (Adigüzel & Orhan, 2017). By having strong metacognitive skills, students can actively monitor, organize and assess their learning process. Proper self-evaluation helps students identify their strengths and weaknesses, so they can adjust their learning

strategies as needed. For example, by recognizing when they are having difficulty understanding certain material, students can change their learning approach or seek additional help. Thus, the self-evaluation mechanism in metacognitive skills not only facilitates more effective learning, but also allows students to become more effective independent learners overall.

Self-improvement mechanisms in metacognitive skills play a crucial role in students' cognitive learning outcomes. Metacognition includes an understanding of how a person learns and solves problems, as well as the ability to regulate and control their cognitive processes (Akben, 2020). When students develop strong metacognitive abilities, they can effectively monitor their understanding, identify difficulties, and apply appropriate strategies to overcome problems (Veenman, 2015). This process of self-improvement allows them to become more independent and efficient learners. Thus, the ability to manage and improve metacognitive skills has a direct impact on progress in understanding subject matter and achieving better learning outcomes.

Metacognitive skills enable students to monitor their own understanding during the learning process (Veenman, 2015; Peña-Ayala, 2015). Students who have good metacognitive awareness will be able to identify when they do not fully understand the material and will take the necessary actions to overcome these difficulties, such as seeking additional explanations or asking the teacher. In this way, they can prevent gaps in understanding that could hinder their ability to master the subject matter. Metacognitive skills enable students to evaluate the effectiveness of the learning strategies they use, this is intended to facilitate understanding of the concepts they are studying. Understanding concepts as a manifestation of cognitive abilities will be able to be empowered well. Learners who are able to monitor and evaluate their approach to learning will be more likely to make adjustments when necessary (Jankowski & Holas, 2014; Stanton, 2021). For example, when a student finds that their usual learning method is not effective for a particular material, they can try a new approach or change their strategy to suit their learning needs.

Metacognitive skills provide a strong foundation for higher cognitive learning achievements (Adigüzel & Orhan, 2017; Lund & Russell, 2022). With deep self-awareness about

their own learning process, students can manage their time and effort efficiently, increase their understanding of the material, and increase their ability to solve problems and apply knowledge in new contexts. Therefore, the relationship between metacognitive skills and students' cognitive learning outcomes is very close and influences each other.

Metacognition acts as a foundation for cognitive activities so that they always know the most appropriate learning strategies to understand information better (Tachie, 2019). Apart from that, metacognitive skills influence students' cognitive learning outcomes because they play a role in long-term memory or retention (Bahri, 2016; Palennari, 2016). Students' awareness of understanding certain information encourages them to continuously re-study learning material, change learning strategies, until they finally understand it and are able to absorb and store it in long-term memory. As a result, students get sufficient cognitive learning results and values when taking the test (Saputri & Corebima, 2020).

Metacognition is a person's ability to use previous knowledge to plan strategies for approaching learning tasks, take the steps necessary to solve problems, reflect and evaluate results, and modify approaches as needed (Jankowski & Holas, 2014). Metacognition helps students select the appropriate cognitive tools for the task and plays an important role in successful learning (Scanlon, 2014). In this context, metacognitive is a higher mental ability to understand one's own understanding that helps learners solve problems, evaluate one's own knowledge and the task at hand, critical thinking, which helps one achieve certain goals, helps one to ensure that the learning objectives have been achieved (Jankowski & Holas, 2014; Scanlon, 2014).

Ye, et.al (2018) explained that metacognition is an ability that allows someone to introspectively monitor and control their own cognitive processes. This includes self-awareness of how they process information, understanding the strategies they use in problem solving, and the ability to regulate their attention and focus (Ye, et.al, 2018; Stanton, et.al, 2021; Lund & Russell, 2022). With metacognitive abilities, a person can evaluate the effectiveness of their cognitive strategies, identify errors in thinking, and adjust their approach according to the demands of the situation or task at hand. This ability is an



important aspect of independent learning, problem solving, and effective decision making.

Metacognition is a concept that refers to humans' reflective abilities that enable them to actively think about and evaluate their own thought processes. It involves the ability to understand how we think, make sense of what we know, and be aware of what strategies we use when solving problems or facing cognitive challenges. By using these metacognitive abilities, a person can better manage and direct their thought processes, including identifying their weaknesses and strengths, as well as correcting ineffective strategies. Thus, metacognition not only allows us to understand ourselves better in a cognitive context, but also helps in improving our overall cognitive performance (Lund & Russell, 2022).

Metacognition is an important ability in the learning and problem-solving process. This includes the ability to understand, monitor, and organize the way we think and process information. With metacognition, a person can actively monitor their understanding of material, notice any difficulties or confusion, and take steps to resolve the problem. Apart from that, metacognition also involves the ability to organize effective learning strategies, such as choosing study techniques that are appropriate to the type of information being studied or managing time and a conducive learning environment. Thus, metacognition provides greater control over our cognitive processes, allowing us to become more effective and independent learners (Fleming and Frith, 2014). Metacognition is the ability to be aware of and control our own thought processes as we learn. In other words, it is awareness of how we learn and the ability to organize and manage that learning process. Strong metacognitive abilities have a significant impact on students' learning and performance (Stanton, et. al, 2021; Lund & Russell, 2022). When students can recognize what strategies are effective for them in understanding and remembering information, they tend to become more efficient and independent learners. They can evaluate their own understanding, determine when they need to seek additional help, and make changes in their learning approach as needed. Developing metacognitive skills is key to improving student learning outcomes. (Stanton, et.al, 2021).

Metacognition is not only about understanding subject matter, but also about

understanding yourself as an active and responsible learner (Chang, et. al, 2021). Metacognition, which is an understanding of how a person thinks and learns, has been proven to be a crucial element in achieving academic success for students. The ability to be aware of, control, and regulate one's own cognitive processes provides a strong foundation for effective learning (Veenman, 2015; Chang, et. al, 2021). These are not simply skills that come naturally, but cognitive strategies that can be developed throughout life. By having awareness of the way, they learn and how they process information, students can improve their learning efficiency, identify weaknesses, and develop more effective strategies.

## CONCLUSION

The research results show that there is a relationship between metacognitive skills and students' cognitive learning outcomes in learning using the Reading Concept-Student Team Achievement Divisions (ReMap-STAD) model. The correlation coefficient ( $r$ ) value of metacognitive skills with cognitive learning outcomes is 0.945 (very high). The direction of the relationship between metacognitive skills and cognitive learning outcomes is a positive relationship. The coefficient of determination ( $r^2$ ) is 0.893, so it can be explained that the variability in students' cognitive learning outcomes is determined by 89.3% of metacognitive skills. The regression significance value proves that the regression line equation can be used for predictions. The regression line equation for the relationship between metacognitive skills and cognitive learning outcomes using the Reading Concept-Student Team Achievement Divisions (ReMap-STAD) model is  $\hat{Y} = 1.246 + 1.058X$ .

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