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Analysis Questioning Skills of Biology Education Student Based on Different Academic Abilities and the Correlation With Metacognitive Skills

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Abstract: The aim of this research is to determine the questioning skills of Biology Education students based on different academic abilities and their correlation with metacognitive skills. This study employs a mixed methods design. The sample in the study consists of biology education students from the Faculty of Teacher Training and Education, University of Mataram. The instruments used in this research include the Questioning Skills Instrument and an Achievement test to measure metacognitive skills. The data analysis used in this research includes descriptive and inferential statistical analysis (correlation and regression). The results of the qualitative analysis using descriptive statistics show that the questioning skills of students with low academic performance mostly remain at level C2 (comprehension questions), comprising 58% of the questions, and C1 (recall questions), comprising 38% of the questions. A small proportion were able to formulate questions at level C3 (application questions), comprising 15% of the questions, and only 1% were able to formulate questions at level C4 (analysis questions). For students with high academic performance, most of the questioning skills were at level C3 (application questions), comprising 36.67% of the questions, and C2 (comprehension questions), comprising 35.56% of the questions. Additionally, 18.89% of the questions reached level C4 (analysis questions), and 3.33% reached level C5 (evaluation questions). Only a small proportion formulated questions at level C1 (recall questions), comprising 1.11% of the questions. The analysis of the relationship between questioning skills and metacognitive skills indicates that there is a relationship between students' questioning skills and metacognitive skills when using the Reading Concept Mapping-Reciprocal Teaching (ReMap-RT) learning model, with a correlation coefficient of 0.868 (high). The direction of the relationship between questioning skills and metacognitive skills is positive. The coefficient of determination (r^2) is 0.754, which explains that the variability in students' metacognitive skills is determined by 75.4% of the questioning skills. The significance value of this regression is also used to determine whether the regression equation can be used for prediction. If the significance value of the regression is less than the determined significance level, then the regression equation can be used for prediction. Based on the analysis results, the regression significance value is 0.00 < 0.05, so it can be concluded that the regression equation can also be used for prediction. The regression equation for the relationship between questioning skills and metacognitive skills of students using the Reading Concept Mapping-Reciprocal Teaching (ReMap-RT) learning model is $\hat{Y} = 38.791 + 3.185X$.

Keywords: Questioning Skills; Metacognitive Skills, Academic Abilities.

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Introduction

Asking questions is a verbal expression that seeks a response from the person being asked (Kusuma, 2023). The response given can range from knowledge to considerations made (Nappi, 2017). Therefore, asking questions is an effective stimulus that encourages thinking abilities. Questioning skills are very important for students to master (Nappi, 2017). Through these skills, students can create a more meaningful learning environment (Kusuma, 2023). Questioning skills are crucial because they are closely related to one's curiosity, which is necessary to identify a situation, phenomenon, or statement (Nurramdhani, 2019).

An essential element in developing questioning skills is the culture of asking questions and good listening skills among students (Nappi, 2017). A culture of asking questions is where students have a sense of curiosity and are ready to ask questions if given the opportunity (Railean, et al., 2017). Questions can be distinguished based on the cognitive level and science process skills contained within them. The cognitive levels referred to align with the revised Bloom's Taxonomy, which includes cognitive levels from the lowest, namely remembering, understanding, applying, analyzing, evaluating, and creating (Anderson & Krathwohl, 2001).

Questions are an important form of instructional interaction because they act as motivational stimuli and have associative enthusiasm and results. Questions posed in teaching and learning activities should be diversified according to their levels (Shanmugavelu, et al., 2020). Higher-order cognitive questions can be defined as those that require students to use higher-order thinking or reasoning skills. By using these skills, students do not just recall factual knowledge. Instead, they use their knowledge to solve, analyze, and evaluate. It is believed that this type of question reveals the most about whether a student has truly understood a concept. This is because a student needs to have a deep understanding of the topic to answer such questions (Arsian, 2006).

In the educational context, higher-level questions are considered to have great potential to measure one's level of understanding of a concept or subject matter. This is because such questions often require a deeper and more comprehensive understanding of the subject being discussed. Questions encourage students to think more critically, analyze information, and develop a deeper understanding. Furthermore, this type of question can also help teachers identify areas where students may need additional support or a better understanding (Kusuma, et al., 2023).

Based on observations, it is known that so far, students' questioning abilities have only been assessed based on how many questions they can ask, rather than the quality of the questions. Thus, the assessment of students' questions is done using a rubric integrated into the observation sheet of activeness, where questioning is one component along with the ability to respond, express opinions, and provide answers. The quality of students' questions has never been evaluated from the cognitive domain perspective based on the revised Bloom's taxonomy by Anderson & Krathwohl (Anderson & Krathwohl, 2010). No research has been conducted to correlate questioning skills with higher-order thinking skills, including metacognitive skills. Schafersman (1991) stated that questioning skills are closely related to metacognitive and critical thinking skills. The link between metacognitive ability and questioning is that metacognitive ability provides a way to control thinking, which ultimately results in critical thinking skills.

Metacognition is the ability that allows a person to supervise and control their own cognitive processes introspectively, by considering, reflecting, and controlling their understanding, thinking, and problem-solving within themselves (Ye, et al., 2018). This means that a person with metacognitive skills will be able to recognize, understand, and regulate their own thinking processes while learning. Metacognition includes understanding how they process information, how they solve problems, and how they manage time and resources when learning. The concept of metacognition refers to the capacity that allows individuals to examine and measure the extent of their cognitive abilities in various contexts and tasks (Lund & Russell, 2022) introspectively and critically. Metacognition is the ability that enables us to actively monitor and control one's thinking and understanding processes, including oversight of how one processes information, recognizes, and understands one's own feelings and beliefs related to what is being learned, and the ability to regulate strategies or actions used in learning and problem-solving (Fleming & Frith, 2014). Metacognition is the awareness and control of thinking for learning. Strong metacognitive skills have the power to influence student learning and performance (Stanton, et al., 2021).

Previous research has successfully developed a Questioning Skills instrument based on the cognitive domain in the revised Bloom's Taxonomy (Kusuma, et al., 2023), which has been validated and can be used to assess the quality of students' questions. The developed Questioning Skills instrument has been tested to evaluate the questioning skills of high school students in Mataram city. The analysis of student questions is

crucial for future learning quality development. Questioning skills and quality are indicators of students' thinking abilities, even indicators of higher-order thinking skills (High Order Thinking Skills). Additionally, previous studies only discussed questioning skills by teachers (Nazzala, 2016; Prasetyaningarum & Rohita, 2014; Rusmayanti, et al., 2017). Based on the conditions described in the background, the aim of this research is to analyze the questioning skills of Biology Education students based on different academic abilities and their correlation with metacognitive skills.

Method

The study uses mixed methods designs. Mixed methods design, also known as mixed research designs, encompass both qualitative and quantitative research in terms of design, data collection, and analysis (Teddlie & Tashakkori, 2009 in Mertens, 2010). Tashakkori and Creswell (2007 in Mertens, 2010) describe mixed methods design as a type of research in which the researcher collects and analyzes data, integrates research findings, and draws conclusions using qualitative and quantitative approaches or methods within a single study. The mixed methods research design adapted from Creswell (2014) as shown in Figure 1 below:

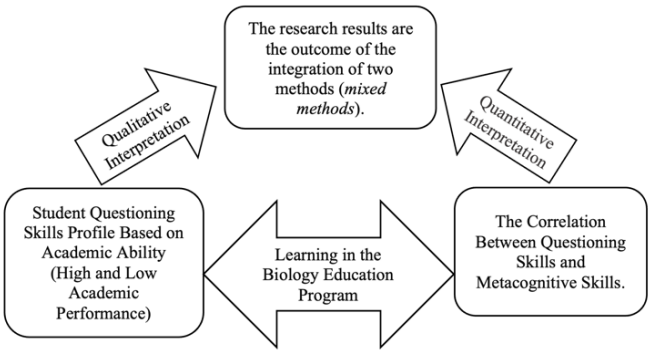

Figure 1. Mixed Method Design

Mixed methods design in this study refer to the use of qualitative methods to answer research questions regarding students' questioning skills based on their academic abilities during coursework, while quantitative methods are used to explain the correlation profile between questioning skills and students' metacognitive skills. According to the mixed methods design, the sampling technique used is identical sampling (the same individuals in both qualitative and quantitative samples). The sample in this study consists of students from the Biology Education program who are currently taking a basic statistics course. The reason for selecting students from the Biology Education research methods course as the research sample is that this course covers complex materials about various types of research methods such as qualitative, quantitative, mixed methods, action research, and development research.

The research methods course carries 3 credits and includes assignments such as mind mapping various types of educational research, critical analysis of articles, self-reflection at each meeting, and a research proposal developed based on problems encountered in real-life learning. The assignments in the research methods course require students to ask questions, starting with mind mapping related to various educational research methods. Critical analysis of research articles also demands that students possess questioning skills related to the content of the analyzed articles. Similarly, self-reflection at the end of each meeting requires students to ask questions and think (metacognitively) about the difficulties they are experiencing while receiving the material and attending the research methods course.

The instruments in this study include the Questioning Skills Instrument and an Achievement Test to measure metacognitive skills. The developed Questioning Skills Instrument refers to the cognitive levels in Bloom's taxonomy, revised by Anderson & Krathwohl (Anderson & Krathwohl, 2001), which include remembering, understanding, applying, analyzing, evaluating, and creating. The cognitive levels of questions in the developed Questioning Skills Instrument are based on Kusuma et al. (2023). The Achievement Test is an instrument for measuring metacognitive skills, which is subsequently assessed using a metacognitive skills rubric. It consists of 7 scales (0-7) and is used as a reference to evaluate students' answers for each test item (Corebima, 2009).
Data analysis used in this study includes correlation analysis and regression analysis. Correlation analysis uses Pearson Product Moment to determine the strength 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,

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

To determine the extent of the contribution of the independent variable to the dependent variable, the coefficient of determination is calculated. The coefficient of determination (r^2) is computed by squaring the correlation coefficient (r) and then

multiplying by 100%. Regression analysis is used to make predictions using predictor variables and response variables (Weisberg, 2014; Lewis-Beck & Lewis-Beck, 2015). To determine the value of the regression coefficients and the regression line equation, a regression analysis using simple linear regression is conducted. Regression analysis is a statistical technique used to investigate and model the relationship between variables (Montgomery et al., 2015; James et al., 2023). The regression equation used is,

$$\hat{Y} = a + bX$$

Before analyzing using simple regression analysis, the data is first analyzed for normal distribution and linearity pattern as part of the classical assumption tests for simple regression analysis. Normality test analysis is performed using the Shapiro-Wilk test. The Shapiro-Wilk normality test examines how well the research data distribution fits the normal curve when the sample size is less than 50 (Razali, 2011; Siebert et al., 2018; González-Estrada & Cosmes, 2019). Linearity testing is conducted to determine the relationship pattern between metacognitive skills and cognitive learning outcomes. One of the linearity tests that can be used is the F-test (Kusuma & Nurmawanti, 2023).

Result and Discussion

The research results are explained in detail, starting with a descriptive analysis of students' questioning abilities based on different academic levels. The questioning skills of students in the low academic group can be seen in Figure 2 below,

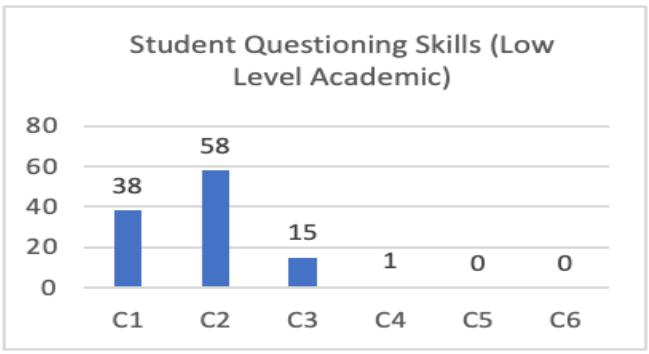

Figure 2. Students' Questioning Skills with Low Level Academic

Based on Figure 2, the questioning skills of students with low academic performance are mostly at the C2 level (comprehension questions), accounting for 58% of the questions, and C1 level (recall questions), accounting for 38% of the questions. A small portion can formulate C3 level questions (application questions), accounting for 15% of the questions, and only 1% are able to formulate C4 level questions (analysis questions). The questioning skills of students in the high academic group can be seen in Figure 3 below.

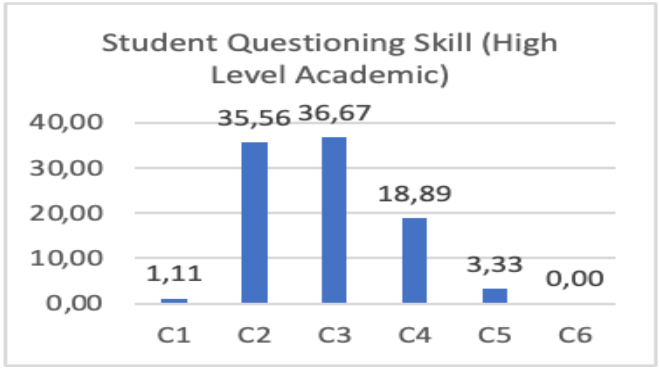

Figure 3. Students' Questioning Skills with High Level Academic

Based on Figure 3, the questioning skills of students with high academic achievement are mostly at the C3 level (application questions), accounting for 36.67% of questions, and at the C2 level (comprehension questions), accounting for 35.56% of questions. Additionally, 18.89% of questions are at the C4 level (analysis questions), and 3.33% of questions are at the C5 level (evaluation questions). Only a small portion of questions are at the C1 level (recall questions), which is 1.11% of the total. Furthermore, the data on questioning skills and metacognitive skills are analyzed using inferential statistics (correlation and regression). Before conducting the inferential statistical analysis, classical assumption testing is performed. The results of the classical assumption tests for the research data, namely normality and linearity, are presented in Table 1 below.

Tabel 1. Summary of Normality Test

	Shapiro-Wilk		
Variable	Statistic	Df	Sig.
Questioning Skills	.957	37	.165
Metacognitive Skills	.970	37	.399

Based on the summary of the data normality test results using the Shapiro-Wilk test in Table 1, the questioning skills data is normally distributed with a significance value of 0.165, which is greater than the predetermined significance level of 0.05. The metacognitive skills data is also normally distributed with a significance value of 0.399, which is greater than the predetermined significance level of 0.05. In addition

to the normality test, a linearity test was also conducted on the research data. The results of the linearity test can be seen in Table 2 below.

Table 2. Summary of Linear Test Results

			Sum Of Squares	Df	Mean Square	F	Sig.
METACOGNITIVE_SKILLS * QUESTIONING_SKILLS	Between Groups	(Combined)	4711.742	11	428.340	9.442	.000
		Linearity	4407.206	1	4407.206	97.148	.000
		Deviation From Linearity	304.536	10	30.454	.671	.740
	Within Groups		1134.150	25	45.366		
	Total		5845.892	36			

Based on the results of the linearity test, it is known that the significance value for the linearity of learning outcomes data with metacognitive skills is 0.00 < 0.05. Thus, it can be concluded that the pattern of the relationship between questioning skills and metacognitive skills is linear. 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 the two variables is considered linear. Based on the analysis results, it is known that the significance value of Deviation from Linearity is 0.740 > 0.05. Therefore, it can be concluded that the pattern of the relationship between questioning skills and metacognitive skills is linear. The next results explain the regression coefficient values, which can be seen in Table 3.

Table 3. Results of Regression Coefficient Analysis

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4407.206	1	4407.206	107.217	.000[b]
	Residual	1438.686	35	41.105		
	Total	5845.892	36			

Based on the analysis results in Table 3, the regression significance value is 0.00 < 0.05. Therefore, H0, which states that there is no relationship between questioning skills and students' metacognitive skills using the Reading Concept Mapping-Reciprocal Teaching (ReMap-RT) learning model, is rejected, and Ha, which states that there is a relationship between questioning skills and students' metacognitive skills using the ReMap-RT learning model, is accepted. This regression significance value is also used to determine whether the regression line equation can be used for prediction. If the regression significance value < the specified significance level, then the regression line equation can be used for prediction. Based on the analysis results, it can be concluded 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 (r) that explains the strength of the relationship between metacognitive skills and cognitive learning outcomes, as well as the coefficient of determination (r^2) that explains the extent of the predictor variable's influence on the response variable, can be seen in Table 4.

Tabel 4. The Correlation Coefficient and the Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.868[a]	.754	.747	6.41134

Based on Table 4, the correlation coefficient (r) between questioning skills and metacognitive skills is 0.868 (high). The direction of the relationship between questioning skills and metacognitive skills is positive. The coefficient of determination (r^2) is 0.754, indicating that 75.4% of the variability in students' metacognitive skills is explained by their questioning skills. The pattern of the relationship between questioning skills and metacognitive skills based on the scatterplot analysis can be seen in Figure 4 below.

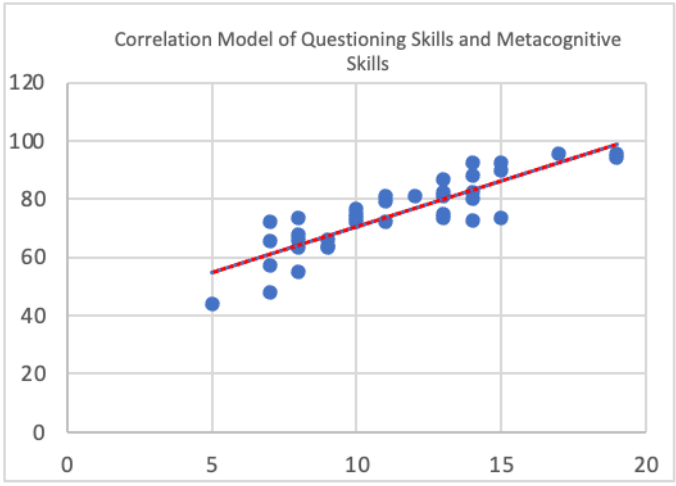

Figure 4. Correlation Model of Questioning Skills and Metacognitive Skills

Based on Figure 4, the relationship between questioning skills and metacognitive skills forms a positive linear relationship. The depiction of the regression line equation for the relationship between questioning skills and metacognitive skills can be seen in Table 5 below.

Table 5. Description of the regression line equation for the relationship between questioning skills and metacognitive skills.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	38.791	3.647		10.636	.000
	QUESTIONING_SKILLS	3.185	.308	.868	10.355	.000

Based on Table 5, the intercept of the regression line equation is 38.791. The slope value is 3.185. This slope value means that for every 1 unit increase in the questioning skills variable, the value of the metacognitive skills variable will increase by 3.185. The regression line equation for the relationship between questioning skills and students' metacognitive skills using the Reading Concept Mapping-Reciprocal Teaching (ReMap-RT) learning model is $\hat{Y} = 38.791 + 3.185X$.

Based on the research findings, it was found that students with low academic ability tend to ask more questions at levels 1, 2, and 3. Nappi (2017) explain that students with low academic ability tend to ask more questions at low order thinking levels because they are still in the early stages of deeply understanding the material. Questions at these levels generally relate to basic facts, direct comprehension, and simple application, reflecting their efforts to build a strong foundation of knowledge (Walsh & Sattes, 2016). The critical and analytical thinking skills required to formulate higher-level questions, such as deep analysis, synthesis, or evaluation have not yet developed optimally. Therefore, they feel more comfortable asking questions that help them clarify basic concepts, understand instructions, or connect the information they receive with prior learning experiences. This also reflects their strategy to reduce confusion and enhance understanding before they can move on to more complex cognitive levels.

Meanwhile, students with high academic ability are already capable of asking questions at levels 4 and 5. Students with high academic ability are more capable of asking questions at level 4 (analyzing) and level 5 (evaluating) because they possess a deeper understanding of the material being studied (Walsh & Sattes, 2016; Davoudi & Sadeghi, 2015). They do not simply recall or comprehend information, but are also able to identify relationships between concepts, compare different perspectives, and recognize strong and weak arguments (Ermasari, et. al, 2014). Their more advanced critical thinking skills enable them to pose questions that challenge assumptions, evaluate evidence, and assess the effectiveness or validity of ideas or theories. In addition, their broader learning

experiences support their ability to connect new material with prior knowledge in a more complex and meaningful way (Gong & Drake, 2020; Veenman, 2020).

Based on the result of the data analysis, there is a significant relationship between questioning skills and students' metacognitive skills, with a correlation coefficient of 0.868. This indicates a high relationship between questioning skills and students' metacognitive skills (Jackson, 2009; Ravid, 2011).

The analysis shows that 75.5% of students' metacognitive skill scores are influenced by their questioning skills. This finding highlights that students' ability to ask meaningful, reflective, and critical questions significantly contributes to the development of their metacognitive skills, such as planning, monitoring, and evaluating their thinking processes (Veenman, 2020). The practical implication for educators is the importance of creating a learning environment that fosters a culture of questioning (Roebers, et.al, 2021, Veenman, 2020). Teachers should design instructional strategies that provide opportunities for students to actively ask questions, such as through open discussions, problem-based learning, or collective reflection (Geurtens, et.al, 2018). Additionally, educators need to guide students in developing deep and relevant questions, as this not only stimulates critical thinking but also strengthens students' awareness and control over their own learning processes (Tamsyani, 2016; Sihaloho, 2018).

This result shows that students 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. Questioning skills and metacognitive skills are closely related and mutually supportive in the learning process. Questioning allows students to delve deeper into information, clarify concepts, and explore various perspectives, all of which play a crucial role in the development of a deeper understanding. Meanwhile, metacognitive skills involve students' ability to be aware of, regulate, and control their own thinking processes, including planning learning strategies, monitoring progress, and evaluating outcomes. When students ask questions, they actively engage their metacognitive skills by identifying what they know and what they do not understand, as well as designing steps to close those knowledge gaps. Thus, the ability to ask questions not only enriches the learning process but also strengthens students' metacognitive abilities in managing their learning independently and reflectively.

One characteristic of critical thinkers is the ability to ask important questions and problems and formulate them clearly and precisely. This shows that critical thinkers can identify relevant and important issues in a context (Kusuma, 2023). Questions can help someone understand a concept or information better. When someone is asked a question, they must process relevant information to formulate a correct answer, which encourages the process of understanding. Questions are often related to problem-solving. When someone faces a question that requires a solution or answer, they must use cognitive processes such as analysis, reasoning, and decision-making to find the correct answer. Questions can also serve as tools for exploration. Questions can also help trigger memory. When someone is asked about something they have learned or experienced, they need to access their memory to find the correct answer (Ermasari, et. al, 2014).

Another feature of critical thinkers is the ability to generate new, useful, and relevant ideas for solving tasks or addressing problems. This indicates that critical thinkers are not only capable of asking questions but also of developing new solutions that can be applied in specific situations (Kusuma, et.al, 2014). Critical thinking also plays an important role in evaluating the benefits of new ideas, selecting the best ideas to apply, and, if necessary, modifying those ideas to better fit the existing needs or situations (Davoudi & Sadeghi, 2015). In other words, critical thinkers not only create new ideas but also can critically analyze those ideas to make appropriate decisions based on rational and argumentative thinking. Thus, critical thinking is a valuable skill in various aspects of life, both in academic contexts and the real world. High-level questioning is essential for developing students' critical thinking abilities. Students use questions to eliminate uncertainty and seek new ideas (Davoudi & Sadeghi, 2015).

Metacognition is always related to learning, remembering, and academic activities (Roebers, et.al, 2021). Metacognition is defined as the ability to reflect on, understand, and control learning. Metacognitive experiences provide students with knowledge insights (Roebers, et.al, 2019). Basic metacognitive abilities influence children's memory performance for their future development (Geurtens, et.al, 2018). Metacognition affects perception and information processing in a way that helps students improve learning outcomes (Tamsyani, 2016; Sihaloho, 2018).

Metacognitive skills refer to conscious control processes such as planning, monitoring progress, effort allocation, strategy use, and cognitive regulation (Nongtodu & Bhutia, 2017). Questioning skills and metacognitive skills are two key elements in the learning process that reinforce each other, especially among students. Questioning skills involve the

students' ability to ask relevant, critical, and deep questions aimed at clarifying information, identifying areas of misunderstanding, and exploring new perspectives (Rocca, 2010). In a learning context, good questions can stimulate discussion, enhance engagement, and deepen understanding of the material. Questioning skills are also an indicator of students' active involvement in the learning process, which, according to Khait (2020), can improve learning outcomes and support the development of critical thinking.

On the other hand, metacognitive skills refer to awareness and control over thinking and learning processes, including planning, monitoring, and evaluating learning strategies (Schraw, 2009). Metacognition helps students understand how they learn, what they know, and what they need to learn further (Lai, 2011). When students ask questions, they are not only seeking new information but also using their metacognitive skills to identify knowledge gaps, plan appropriate learning strategies, and monitor the effectiveness of their learning process (Undorf et.al, 2021).

Recent research shows that questioning skills can serve as a tool to activate and enhance metacognitive skills. For example, a study by Gong and Drake (2020) found that students who actively ask questions tend to have higher metacognitive awareness, meaning they are better able to identify areas where they need to deepen understanding or change learning strategies. This suggests that questioning skills can trigger metacognitive reflection, which in turn improves self-regulation in learning. Additionally, questioning skills can strengthen metacognitive skills by encouraging students to continuously reflect on their learning processes, make necessary adjustments, and ultimately achieve deeper and more lasting understanding (Muis, Bendixen, & Haerle, 2006).

Questioning skills not only function as a tool for gathering information but also as an important mechanism in the development of metacognitive skills (Shamnugavelu, et.al, 2020). By asking questions, students are not only actively engaged in learning but also learning to be more reflective and adaptive in facing academic challenges. This close relationship shows that developing questioning skills can be an effective strategy for enhancing students' metacognitive skills, which ultimately contributes to their academic success.

The relationship between a person's questioning skills and their metacognitive skills is closely related, as demonstrated by recent research. Metacognition, which includes the ability to monitor and control one's own thinking processes, is crucial in developing critical thinking skills and the ability to ask questions effectively. According to research, metacognitive skills help individuals become more aware of how they think, which in turn affects how they formulate and ask deeper and more relevant questions (Li, et.al, 2023).

Studies examining the relationship between metacognition and critical thinking have found a strong positive relationship between metacognitive strategies and motivation for critical thinking. Although the direct relationship between metacognition and critical thinking skills may not always be strong, metacognition influences a person's motivation to engage in critical thinking, which ultimately affects their ability to ask questions in a more reflective and profound manner (Suryana, et.al, 2021; Ossa, et.al, 2023).

Moreover, in the context of collaborative learning, metacognitive teaching has been shown to enhance students' learning achievements, including computational thinking and critical thinking skills, both of which heavily rely on good questioning skills. Metacognitive teaching helps students not only in formulating questions but also in understanding the context and purpose behind those questions, enriching their learning process, and understanding (Li, et.al, 2023).

Effective questioning skills are not only related to factual knowledge or understanding of the material but are also greatly influenced by metacognitive awareness and self-reflection abilities that enable individuals to actively regulate and assess their own thinking processes. A person's questioning ability is a tangible manifestation of metacognitive skills, that is, the ability to understand and regulate one's own thinking processes. According to Flavell (1979), who first introduced the concept of metacognition, this ability includes knowledge about thinking strategies, monitoring the thinking process, and regulating or controlling thinking. Metacognitive knowledge includes understanding the cognitive tasks to be performed, possible strategies to be used, and knowledge about oneself as a learner. Metacognitive regulation includes the ability to plan, monitor, and evaluate the learning and problem-solving processes.

A person with high metacognitive ability will be better able to identify gaps in their understanding and thus be more proactive in asking relevant and meaningful questions (Schaeffner et.al, 2021). Asking questions is one way to control the learning process, focus on unclear information, and help integrate new information with existing knowledge. Good questions not only serve to obtain information but also to trigger

reflection and critical thinking, which are at the core of metacognition (Rivas et.al, 2021; Parlan & Rahayu, 2021).

Recent studies also support the importance of this relationship. For example, research by Tanner (2012) shows that good questioning skills can enhance self-awareness and self-regulation in the learning process, ultimately improving learning outcomes. This research highlights that questioning skills function not only as a communication tool but also as an important mechanism in developing metacognitive abilities. In an educational context, students taught to ask deep and reflective questions tend to have better metacognitive abilities, which then positively impacts their academic performance (Salmon & Berrera, 2021; Garrison, 2022).

Furthermore, according to recent research by Veenman et al (2020), the process of effective questioning plays a crucial role in developing metacognitive regulation. Through questioning, individuals can focus on important aspects of a problem, monitor their own understanding, and adjust learning strategies as needed. This process reflects higher self-regulation and the ability to manage thinking processes more effectively. Thus, good questioning skills not only reflect an individual's metacognitive abilities but also serve to enhance these abilities. The relationship between the two is very close and mutually influential, where strengthening one aspect positively impacts the reinforcement of the other.

This underscores the importance of developing questioning skills as part of efforts to improve metacognitive abilities, both in educational contexts and in personal development more broadly. Metacognition is the ability to understand and regulate one's learning processes as well as comprehension of the subject matter. With good planning mechanisms in metacognition, learners can effectively manage their time, resources, and learning strategies (Jaleel, 2016). They can actively monitor their understanding of the material, identify weaknesses, and adjust their learning approaches according to their needs (Schuster, et al., 2020). Thus, they can enhance the efficiency and effectiveness of their learning. Moreover, through thorough planning, learners can also develop better problem-solving skills, creativity, and reasoning, all of which are important for achieving better learning outcomes. Good planning mechanisms in metacognition not only affect learners' academic achievements but also prepare them to be independent learners and successful in various areas of life (Kyriakides, et al., 2020).

Conclusion

The conclusion of the research is that students with low academic performance mostly have questioning skills at level C2 (comprehension questions), with 58 questions, and C1 (recall questions), with 38 questions. A small number can formulate questions at level C3 (application questions), with 15 questions, and only 1 can formulate questions at level C4 (analysis questions). On the other hand, students with high academic performance mostly have questioning skills at level C3 (application questions), with 33 questions, and C2 (comprehension questions), with 32 questions. Additionally, there are 17 questions at level C4 (analysis questions) and 3 questions at level C5 (evaluation questions). Only a small number of questions are at level C1 (recall questions), with 1 question.

The analysis of the relationship between questioning skills and metacognitive skills shows a correlation between questioning skills and metacognitive skills in students using the Reading Concept Mapping-Reciprocal Teaching (ReMap-RT) model, with a correlation coefficient of 0.868 (high). The direction of the relationship between questioning skills and metacognitive skills is positive. The coefficient of determination (r^2) is 0.754, which indicates that 75.4% of the variability in students' metacognitive skills is explained by questioning skills. The significance value of the regression is also used to determine whether the regression line equation can be used for prediction. If the significance value is less than the specified significance level, the regression equation can be used for prediction. Based on the analysis, the significance value of the regression is $0.00 < 0.05$, so it can be concluded that the regression equation can be used for prediction.

The intercept value is 38.791. The slope value is 3.185. This slope means that for every increase of 1 in the variable of questioning skills, the metacognitive skills variable will increase by 3.185. The regression line equation for the relationship between questioning skills and metacognitive skills using the ReMap-RT learning model is $\hat{Y} = 38.791 + 3.185X$. Suggestions for future research include developing learning models that enhance both questioning skills and metacognitive skills of students, as well as expanding the research variables. Given the significant relationship between questioning skills and metacognitive skills using the ReMap-RT model, future research could expand the variables to include other skills such as critical thinking, problem-solving, and collaborative skills to obtain a more comprehensive understanding of how

questioning skills play a role in broader learning contexts.

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