Proceeding of 2nd International Conference on Education, Society and Humanity
e-ISSN : 2986-5832
p-ISSN : 2986-6979

Vol. 02 No. 02 (2024)
Available online at https://ejournal.unuja.ac.id/index.php/icesh

MAHASANTRI METACOGNITIVE STRATEGY TADRIS MATHEMATICS STUDY PROGRAM IN SOLVING QUESTIONS BASED ON HIGHER ORDER THINKING SKILLS (HOTS)

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Abstract

Higher order thinking abilities or Higher Order Thinking Skills (HOTS) is a crucial aspect in mathematics education, especially in producing graduates who are able to think critically, creatively and reflectively. However, many students still experience difficulties in solving HOTS-based questions due to a lack of systematic thinking strategies. Metacognitive strategies is an approach that can help students plan, monitor and evaluate their thinking processes effectively. Therefore, this research aims to explore the application of metacognitive strategies in solving HOTS questions among students of the Tadris Mathematics Study Program and identify the factors that influence their success. This research uses system literature review (SLR) method by reviewing various academic sources related to metacognitive strategies in learning mathematics. The research results show that metacognitive strategies play an important role in increasing the effectiveness of HOTS learning, where students who have good metacognitive awareness are better able to develop flexible and systematic problem solving strategies. Factors that influence the success of this strategy include students' cognitive readiness, the role of lecturers in learning, a conducive learning environment, and curriculum policies that support the development of higher order thinking skills. The conclusion of this research confirms that metacognitive strategies must be integrated optimally in mathematics learning to improve students' HOTS skills. The main recommendation from this research is the need for training for lecturers and students regarding metacognitive strategies as well as improving the curriculum so that it is more oriented towards developing critical and reflective thinking skills.

Keywords: *Strategy, Metacognitive, Higher Order Thinking Skills (HOTS), Mathematics Tadris, Literature Review*

INTRODUCTION

Metacognition is an important aspect in learning mathematics, especially in the context of solving questions based on Higher Order Thinking Skills (HOTS). This high-level thinking ability requires students not only to understand mathematical concepts mechanically but also to be able to analyze, evaluate and create new solutions to given problems(Alifiani & El Walida, n.d.).

In the context of Islamic higher education, especially in the Mathematics Education Study Program, metacognitive strategies are very relevant because they not only help students understand mathematical concepts, but also develop a reflective mindset that is in line with the values of Islamic education. Therefore, exploration of students' metacognitive strategies in solving HOTS-based questions is an important issue that needs further research.

In an increasingly competitive era of globalization, education not only focuses on basic cognitive aspects but also on higher-level thinking skills. HOTS in mathematics learning includes three main levels in the Revised Bloom's Taxonomy, namely analyzing, evaluating and creating. This ability is very necessary in the academic and professional world because it requires someone to think critically and creatively in facing complex challenges. Unfortunately, there are still many students who experience difficulties in solving HOTS questions due to a lack of in-depth understanding of the concept and metacognitive skills that have not been well trained(Mutia & Septiana, n.d.-a).

Students studying at the Tadris Mathematics Study Program are expected to have critical thinking skills in understanding, interpreting and solving mathematical problems. However, based on various previous studies, there are still many obstacles found in implementing HOTS among students, such as a lack of awareness of effective learning strategies, limitations in reflecting on their own thoughts, and a lack of experience in dealing with open-ended questions. Therefore, metacognitive strategies are needed that can help students develop higher-level thinking skills(Wulan et al., n.d.).

Metacognitive strategy is an approach that allows students to control and regulate their own thinking processes when learning or solving a problem. Flavell (1979) defines metacognition as a person's awareness of their own thought processes and the ability to control them. In mathematics learning, metacognitive strategies include planning problem solving strategies, monitoring thought processes, and evaluating the solutions that have been produced. By implementing this strategy, student students are not only able to understand concepts more deeply, but are also able to increase efficiency in solving HOTS-based questions(Rui, 2022a).

Several studies have been conducted to explore the role of metacognitive strategies in mathematics learning. Schoenfeld (1987) found that students who actively used metacognitive strategies in solving mathematics problems performed better than those who did not use them. In addition, research conducted by Kramarski & Mevarech (2003) shows that metacognition-based learning can improve students' conceptual understanding and critical thinking abilities in solving complex mathematical problems(Rustaman, 2020).

In Indonesia, research related to metacognitive strategies in solving HOTS questions is still relatively limited, especially among Islamic university students. Rahman (2019) in his research revealed that students tend to experience difficulties in solving HOTS questions because they lack training in reflecting on their own thinking processes. Other research conducted by Putri & Hidayat (2021) shows that students who were trained with metacognitive strategies showed significant improvements in their critical thinking skills.

Although various studies have revealed the importance of metacognitive strategies in mathematics learning, research that specifically explores these strategies in the context of Mathematics Education Study Program students in Islamic universities is still very limited. Therefore, this research aims to fill the gap in the literature by analyzing how students at Sayyid Ali Rahmatullah State

Islamic University Tulungagung apply their metacognitive strategies in solving HOTS questions as well as the factors that influence the effectiveness of these strategies(Suryapuspitarini et al., 2019).

This research aims to identify the types of metacognitive strategies used by students of the Tadris Mathematics Study Program in solving HOTS-based questions. Metacognitive strategies have an important role in helping students solve HOTS questions more effectively. By understanding how students in the Mathematics Education Study Program at UIN Sayyid Ali Rahmatullah Tulungagung apply this strategy, it is hoped that this research can provide new insights into the world of Islamic education, especially in the field of mathematics. By increasing awareness of the importance of metacognitive strategies, it is hoped that students can develop a more reflective, critical and innovative mindset in solving various mathematical problems. Therefore, it is very important to carry out this research to support the development of more effective and meaningful mathematics learning for students at Islamic universities.

METHOD

This research uses the systematic literature review (SLR) method to analyze the metacognitive strategies used by students of the Tadris Mathematics Study Program in solving Higher Order Thinking Skills (HOTS) based questions. The SLR method was chosen because this approach allows researchers to collect, analyze and synthesize various research results that have been carried out previously in the relevant field. Thus, this research aims to identify general patterns, research trends, and key findings related to metacognitive strategies in mathematics learning at the Islamic higher education level.

The initial step in this research is to determine the research questions that will be answered through a literature review. Some of the main questions that are the focus of this research include: (1) What metacognitive strategies do students use in solving HOTS questions? (2) How effective is this strategy in improving higher order thinking skills? (3) What factors influence the successful implementation of metacognitive strategies in mathematics learning? (4) What learning model can improve students' metacognitive strategies? These questions were used as a basis for developing search criteria and selecting literature to be analyzed in this research.

Data sources in this research come from various journal articles, conference proceedings, academic books, and research reports that are relevant to the study topic. Databases used in literature searches include Google Scholar, Scopus, ScienceDirect, Springer, and DOAJ, which provide access to trusted scientific publications. Keywords used in the literature search included "metacognitive strategies in mathematics," "higher order thinking skills (HOTS) in mathematics," "Islamic education and metacognition," and "problem-solving in mathematics for higher education."

Inclusion and exclusion criteria were set to ensure that only relevant and high-quality literature was used in this study. Inclusion criteria included: (1) research that focused on metacognitive strategies in mathematics learning, (2) research that explored the relationship between metacognitive strategies and HOTS, (3) research conducted at the higher education level, particularly in the context of Islamic higher education, and (4) publications published within the

last five to ten years to ensure relevance to current developments in this field. Meanwhile, exclusion criteria include: (1) research that does not specifically discuss metacognitive strategies in the context of mathematics, (2) studies that only focus on theoretical aspects without empirical analysis, and (3) publications that are not available in English or Indonesian.

After the appropriate literature was collected, the analysis process was carried out using a thematic analysis approach, where the research results were grouped based on main themes related to metacognitive strategies in solving HOTS questions. Several themes that emerged from the results of the analysis include planning, monitoring and evaluating as the three main stages in implementing metacognitive strategies in solving mathematical problems. In addition, factors that influence the effectiveness of metacognitive strategies, such as learning motivation, learning environment, and lecturers' teaching approaches, were also identified in the analysis process.

The validity and reliability of this research is maintained by using source triangulation, namely by comparing findings from various literature and looking for similar patterns in various previous studies. Apart from that, the narrative synthesis approach was used to organize the findings systematically, so that it could provide a comprehensive picture of how metacognitive strategies were applied by students of the Tadris Mathematics Study Program in solving HOTS questions.

By using a systematic literature review method, it is hoped that this research can contribute to understanding how metacognitive strategies can be optimized in mathematics learning, especially in the context of Islamic higher education. The findings from this literature review can later be used as a basis for developing more effective learning strategies to improve higher order thinking skills among students.

RESULTS AND DISCUSSION

This research aims to explore the metacognitive strategies used by students of the Tadris Mathematics Study Program in solving Higher Order Thinking Skills (HOTS) based questions. Based on the literature review carried out, it was found that metacognitive strategies have an important role in improving high-level thinking abilities, especially in learning mathematics. This strategy involves a series of processes that include planning, monitoring and evaluating, which contribute to helping students understand, control and direct their thinking when solving complex mathematical problems(In'am & Hajar, 2018).

In the context of Islamic education, the metacognitive approach also has a unique dimension, where problem solving is not only seen as an academic process, but also as a reflection of Islamic spiritual and ethical values. This is in line with the principles of learning in Islam which emphasize the importance of critical and reflective thinking in understanding scientific concepts. Therefore, the metacognitive strategies applied by mahasantri not only involve cognitive aspects, but also reflect an attitude of trust, patience and perseverance in facing academic challenges.

Planning strategies are the first step in the process of solving mathematical problems that require high-level thinking skills. Based on the results of the study, it was found that students who have good planning strategies tend to be more systematic in solving HOTS questions. They are able to identify relevant information, understand the structure of the questions, and determine the most

appropriate approach before starting to work on the questions(Ngilawajan, 2021).

Some planning strategies that are often used by mahasantri include: a. Analyze the questions in depth - Mahasantri with good metacognitive strategies will read the questions carefully, identify key words, and understand the relationship between the concepts in the questions. b. Making sketches or diagrams – In some cases, students use sketches, diagrams or tables to visualize abstract mathematical concepts. C. Determining the most effective solution strategy – Before starting calculations, students will consider the various methods that can be used and choose the most appropriate one based on their understanding of the mathematical concept at hand(Mawardi et al., 2020).

However, not all mahasantri have optimal planning skills. Some of them still tend to immediately work on problems without carrying out analysis first, which makes it difficult for them to develop systematic solutions. Therefore, there is a need for special training that encourages students to be more active in using planning strategies in solving HOTS questions.

Monitoring Strategy (Monitoring) in Solving HOTS Questions

After the planning stage, the next strategy that plays an important role in solving HOTS problems is monitoring. At this stage, students actively monitor their thinking processes while solving problems, ensuring that the steps they take are in accordance with the plan that was made previously.

From the results of the literature review, it was found that students who have good monitoring skills tend to be more thorough in evaluating their progress while working on questions(Fanani, 2019). They are able to recognize mistakes early and correct them immediately before moving on to the next stage. Some monitoring strategies often used by mahasantri include: a. Re-checking every step that has been taken - Mahasantri who implement this strategy will always evaluate the problem solving process by re-reading every step that has been taken to ensure there are no conceptual or operational errors. b. Comparing the solutions obtained with the concepts they already understand – They will try to relate the solutions they are working on with the mathematical concepts they have learned previously to ensure their suitability.c. Using logic and reasoning – This strategy is carried out by considering whether the answer obtained makes sense mathematically or not. If there are any irregularities, they will return to the previous step and look for alternative solutions.

However, there are still many student students who experience difficulties in carrying out effective monitoring. Some of them do not have the habit of evaluating the steps they have taken, so they often only realize their mistakes after the entire problem solving process is complete. This shows that monitoring skills need to be further developed in mathematics learning, for example through self-reflection-based question practice and group discussions.

Evaluation Strategy (Evaluating) in Solving HOTS Questions

The final stage in the metacognitive strategy is evaluating, which focuses on assessing the effectiveness of the strategy that has been used in solving HOTS questions. Evaluation is carried out to find out whether the approach used is optimal or still requires improvement in the future.

Students who have good evaluation skills are usually able to: a. Assess the accuracy of the answers obtained – They will ensure that the results obtained are correct and in accordance with the concepts that have been studied. b. Analyze the strengths and weaknesses of the strategy used – If they find that the approach used is inefficient, they will look for alternative strategies to solve similar

problems in the future. c. Reflecting on learning experiences – Some students note the difficulties they encountered while working on questions and look for ways to improve their understanding so they can do similar questions better in the future(Suryapuspitarini et al., 2022).

From the research results analyzed in the literature review, it was found that student students who are accustomed to evaluating their problem-solving strategies tend to have better development in critical and analytical thinking. However, there are still many students who ignore this stage, making it difficult for them to improve their way of solving HOTS questions. Therefore, reflection-based learning and self-assessment need to be emphasized more in the mathematics education process in Islamic higher education environments.

Implications of Metacognitive Strategies for Mastering HOTS Mahasantri

Based on the results of the study, metacognitive strategies have a significant influence on increasing high-level thinking abilities(Mutia & Septiana, n.d.-b). Mahasantri who apply planning, monitoring and evaluation strategies well show more optimal performance in solving HOTS questions compared to those who do not use this strategy systematically. In the context of Islamic education, metacognitive strategies also have a broader dimension, where reflective and analytical thinking not only aims to improve academic skills, but is also part of a more holistic learning process. Islam teaches its people to always ponder and understand knowledge deeply, as the word of Allah in the Koran encourages humans to think and seek knowledge as part of worship.

To increase the effectiveness of metacognitive strategies in mathematics learning, several recommendations that can be implemented include: a. Applying a reflection-based learning approach - Students need to be trained to always reflect on their thinking processes in solving mathematics problems, for example through reflective journals or group discussions. b. Improve monitoring and evaluation skills – Students need to be given more practice in evaluating their problem solving processes in order to improve the accuracy and efficiency of the strategies used. c. Integrating Islamic values in metacognitive strategies – In learning mathematics, it is important to link metacognitive strategies with spiritual values, such as patience, thoroughness, and honesty in thinking and acting. By implementing more systematic and structured metacognitive strategies, it is hoped that students of the Tadris Mathematics Study Program can be more optimal in developing high-level thinking skills and be able to face academic challenges better.

The effectiveness of metacognitive strategies in improving students' higher order thinking skills.

Metacognitive strategy is an approach that has been proven effective in improving higher order thinking skills (HOTS) among students, including students in Islamic higher education institutions. Metacognition itself refers to a person's awareness of their thought processes and their ability to control and direct these thoughts to be more effective in solving problems. In the educational context, metacognitive strategies include three main aspects, namely planning, monitoring and evaluating, all of which contribute to improving critical, analytical and creative thinking skills(Rui, 2022b).

In HOTS-based learning, students are required to be able to think more complexly, not only memorizing mathematical or other scientific concepts, but also applying them in real situations. Therefore, metacognitive strategies become a very important tool in helping them develop appropriate strategies in solving complex academic problems. Mahasantri who apply this strategy well tend to be

more successful in understanding and elaborating abstract concepts, developing logical arguments, and producing innovative solutions in solving problems.

The Role of Planning Strategy in Improving HOTS

The initial stage in metacognitive strategy is planning, where students determine the steps they will take in solving a problem. An effective planning strategy allows students to identify relevant information, understand the relationship between concepts, and choose the most appropriate method or approach. In learning mathematics, for example, a student who has good planning skills will first read and understand the problem carefully, look for keywords that show the relationship between variables, and consider various alternative solutions before starting to work on the problem.

Research shows that student students who have the habit of planning solution strategies before working on questions tend to be more successful in completing HOTS assignments compared to those who immediately work on questions without careful planning. Thus, good planning skills enable students to think more systematically and strategically, which ultimately increases their ability to solve complex problems(Rustaman, 2019).

Monitoring as an Effort to Increase Thinking Awareness

Apart from planning, another aspect of metacognitive strategy that plays an important role in improving HOTS is monitoring. At this stage, students actively control and supervise the course of their thinking process when working on questions. Effective monitoring allows them to evaluate whether the strategies they use are working well or whether they need to be adjusted to be more optimal.

In HOTS-based learning, monitoring is a very important aspect because it allows students to identify errors early and correct them immediately before they complete their assignments. For example, in solving complex mathematical problems, students who have good monitoring skills will double-check the steps they have taken, ensure that the calculations used are correct, and consider whether the approach they have chosen is in accordance with the concepts they have learned.

Unfortunately, there are still many students who lack good monitoring skills, so they often only realize their mistakes after the entire question-taking process is complete. This shows that monitoring skills need to be further strengthened in learning, for example by providing exercises that encourage students to be more reflective in evaluating every step they take during the problem solving process.

Evaluation as a Means to Increase Self-Awareness

The final stage in metacognitive strategies is evaluation, where students assess the effectiveness of the strategies they have used in completing a task. Good evaluations allow students to understand the strengths and weaknesses of the approaches they are using, as well as look for ways to improve or enhance their strategies in the future(Wulan et al., 2018).

In the context of Islamic education, evaluation also has an important spiritual dimension, where students not only assess the results of their work from an academic perspective, but also in terms of Islamic values, such as honesty, thoroughness and patience in learning. Therefore, effective evaluation strategies not only help students improve higher-order thinking skills, but also strengthen their character as responsible and reflective learners(Hosaini, Fitri, et al., n.d.).

Studies show that students who actively evaluate their thinking processes tend to be more successful in developing HOTS skills. They are better able to identify patterns in problem solving, are more creative in finding solutions, and

are more confident in facing complex academic challenges. Therefore, learning based on self-evaluation needs to be applied more widely in higher education, for example through reflective journals, group discussions, or project-based learning methods that encourage students to continuously evaluate the way they think and learn(Hosaini, Kandiri, et al., n.d.).

Effectiveness of Metacognitive Strategies in the Mahasantri Learning Context

Based on the literature review that has been carried out, it can be concluded that metacognitive strategies have a very significant impact on the development of higher order thinking skills among students(In'am & Hajar, 2019). By implementing planning, monitoring and evaluation strategies systematically, student students not only find it easier to understand complex concepts, but are also better prepared to face higher academic challenges(Arifin et al., 2024).

In the context of Islamic education, the effectiveness of metacognitive strategies can also be linked to learning principles that emphasize the importance of reflective and analytical thinking. Islam itself strongly encourages its followers to always think critically and seek knowledge with full awareness. Therefore, the application of metacognitive strategies in learning not only aims to improve academic skills, but also to form a more holistic mindset and based on Islamic values.

To increase the effectiveness of metacognitive strategies in learning, several recommendations that can be implemented are: a. Implementing reflection-based learning – Mahasantri need to be trained to always reflect on their thinking processes, for example through learning journals or group discussions. b. Provide specific training in monitoring and evaluation skills – Mahasantri need to be taught how to evaluate their own strategies effectively so that they can continuously improve the quality of their thinking. c. Integrating metacognitive strategies with Islamic values - In learning, it is important to link metacognitive strategies with Islamic principles so that learning becomes more meaningful and in line with Islamic values.

By implementing more optimal metacognitive strategies, it is hoped that student students will not only be able to improve their high-level thinking skills, but also become more independent, reflective and responsible learners in their academic processes.

factors that affect the success of applying metacognitive strategies in mathematics learning

The success of implementing metacognitive strategies in mathematics learning is influenced by various interacting factors. Based on research results obtained through literature studies, the main factors that contribute to the effectiveness of metacognitive strategies in mathematics learning include (1) students' cognitive and affective readiness, (2) quality of teaching and the role of teachers, (3) learning environment, (4) technological support and learning media, and (5) curriculum and educational policies(Ngilawajan, 2022).

Students' Cognitive and Affective Readiness

The main factor that determines the success of metacognitive strategies in learning mathematics is students' cognitive and affective readiness. Students who have a strong understanding of mathematical concepts tend to more easily apply metacognitive strategies in solving Higher Order Thinking Skills (HOTS) based questions. They are able to plan, monitor and evaluate their thinking processes more systematically(Mawardi et al., 2019).

From the affective aspect, attitudes and learning motivation greatly influence the effectiveness of metacognitive strategies(Minhaji et al., n.d.). Students with high intrinsic motivation are more likely to use metacognitive strategies to optimize their learning process. In contrast, students who have high math anxiety or lack confidence in their math abilities often have difficulty implementing this strategy. Therefore, learning approaches that emphasize emotional aspects, such as increasing self-confidence and reducing mathematics anxiety, need to be implemented to support the success of metacognitive strategies.

Teaching Quality and the Role of Teachers

The teacher's role in guiding students to develop metacognitive skills is very important. Teachers who have a deep understanding of metacognitive strategies can help students understand their own way of thinking, develop problem-solving plans, and evaluate the effectiveness of the strategies they have used(Fanani, 2022).

Research shows that teachers who use learning strategies based on reflection, scaffolding, and interactive discussions can increase students' metacognitive awareness. Teachers who actively provide feedback and open questions also help students develop critical and reflective thinking skills. However, in practice, there are still many teachers who do not understand how to teach metacognitive strategies effectively. Therefore, special training is needed for teachers to improve their ability to teach this strategy to students.

Supportive Learning Environment

A conducive learning environment is also a key factor in the successful implementation of metacognitive strategies. A classroom atmosphere that supports critical and reflective thinking will encourage students to use metacognitive strategies in learning mathematics. On the other hand, a stressful environment, lack of interaction between teachers and students, and passive teaching methods can hinder the implementation of this strategy(Hosaini, Qomar, et al., n.d.).

The ideal learning environment is one that provides opportunities for students to discuss, ask questions, and explore various problem-solving strategies. Collaboration-based learning, such as group discussions or problem-based learning (PBL), can help students develop metacognitive thinking skills better. Apart from that, support from family and peers also has a big influence in increasing the effectiveness of metacognitive strategies.

Technology Support and Learning Media

Technological advances have opened up great opportunities to support the application of metacognitive strategies in mathematics learning. The use of technology such as learning management systems (LMS), interactive mathematical simulations, and artificial intelligence (AI) based learning applications can help students understand and control their thinking processes.

Several studies show that the use of technology-based applications in mathematics learning can improve students' metacognitive skills by providing direct feedback on the steps they take in solving problems. Apart from that, learning media such as video tutorials, interactive e-modules, and gamification in mathematics learning can also improve students' reflective and evaluative skills.

However, not all students have the same access to technology. Economic and infrastructure factors in various regions are still obstacles to the use of technology in learning. Therefore, the integration of technology in mathematics

learning needs to be designed by considering aspects of inclusivity so that all students can benefit from technology-based learning strategies.

Curriculum and Education Policy

Educational policies that support the development of metacognitive skills in the curriculum also play an important role in the success of this strategy. A curriculum that emphasizes problem-solving, critical thinking, and HOTS-based approaches will encourage students to more actively use metacognitive strategies in learning mathematics.

However, in some educational systems, there is still a tendency to focus more on memorization and procedural rather than problem solving which emphasizes conceptual understanding. Curricula that are too dense and evaluation methods that only measure final results without considering students' thinking processes can also hinder the application of metacognitive strategies in learning(Cahyono et al., n.d.).

To overcome this, there needs to be curriculum reform that places more emphasis on developing critical and reflective thinking skills. The assessment system also needs to be directed to not only assess the final answer, but also consider the thinking process carried out by students in solving a problem.

Research Implications for Mathematics Learning

Based on the research results, it can be concluded that the application of metacognitive strategies in mathematics learning is very dependent on various factors, both in terms of students, teachers, learning environments, technology and educational policies. To increase the effectiveness of metacognitive strategies in learning, several steps that can be taken include: a. Increasing students' awareness and readiness in using metacognitive strategies, both through special training and reflection-based learning. b. Provide training for teachers in teaching metacognitive strategies so that they can guide students in developing critical and reflective thinking skills. c. Creating a learning environment that supports metacognitive strategies, such as discussion-based learning, collaboration, and self-reflection. d. Optimizing the use of technology in mathematics learning to help students understand and evaluate their thinking processes. e. Carry out curriculum and educational policy reforms to place greater emphasis on developing higher-order thinking skills and metacognitive strategies.

By paying attention to these factors, it is hoped that the application of metacognitive strategies in mathematics learning can be more effective and have a positive impact on students' understanding and achievement in solving HOTS-based questions.

CONCLUSION

Based on the results of research regarding the Metacognitive Strategy of Mahasantri Tadris Mathematics Study Program in Solving Questions Based on Higher Order Thinking Skills (HOTS), it can be concluded that metacognitive strategies have a very important role in improving students' high-level thinking abilities. This strategy helps student students plan, monitor and evaluate their thinking processes when solving HOTS questions, so that they can understand mathematical concepts in more depth and apply them in various contexts. The main findings of this research show that the success of implementing metacognitive strategies is influenced by various factors, including (1) students' cognitive and affective readiness, (2) the quality of teaching and the role of lecturers, (3) a supportive learning environment, (4) the use of technology in

learning, and (5) curriculum policies that emphasize the development of critical and reflective thinking skills. Mahasantri who have good metacognitive awareness tend to be better able to develop problem-solving strategies systematically and flexibly, as well as reflect on the effectiveness of the strategies they use. Apart from that, this research also highlights the important role of lecturers in guiding students in developing metacognitive skills through learning approaches based on reflection, discussion and problem solving. A conducive learning environment and the use of technology in mathematics learning can also support the development of higher order thinking skills. As a recommendation, further training is needed for lecturers and students in optimizing metacognitive strategies in mathematics learning. In addition, the curriculum needs to be designed to be more oriented towards developing critical thinking skills and in-depth problem solving. In this way, it is hoped that student students will be better prepared to face academic and professional challenges in the future with better thinking skills.

REFERENCES

Alifiani, A., & El Walida, S. (n.d.). Proses Metakognitif Mahasiswa dalam Mengerjakan Soal Higher Order Thinking Skills Ditinjau dari Gaya Kognitif. *Prima: Jurnal Pendidikan Matematika*, *4*(2), 84–99. https://doi.org/10.31000/prima.v4i2.2614

Arifin, S., Chotib, M., Rahayu, N. W. I., Hosaini, H., & Samsudi, W. (2024). Kiai's Transformative Leadership in Developing an Organizational Culture of Islamic Boarding Schools: Multicase Study. *AL-ISHLAH: Jurnal Pendidikan*, *16*(2), 2608–2620. https://doi.org/10.35445/alishlah.v16i2.5325

Cahyono, C., Judijanto, L., Hutahaean, E. S. H., Nisa, U. W., Mulyadi, M., & Hosaini, H. (n.d.). Pesantren Education as Indonesia's Indigenous Heritage: Nurturing Moral Education in the Digital Era. *At-Ta'dib*, *19*(1), 177–193.

Fanani, Z. (2019). Pengembangan Soal HOTS untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Jurnal Pendidikan Matematika*, *12*(1), 15–26.

Fanani, Z. (2022). Pengembangan Soal HOTS untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Jurnal Pendidikan Matematika*, *12*(1), 15–26.

Hosaini, H., Fitri, A. Z., Kojin, K., & Alehirish, M. H. M. (n.d.). The Dynamics of the Islamic Education System in Shaping Character. *Edukasia: Jurnal Penelitian Pendidikan Islam*, *19*(1), 79–98.

Hosaini, H., Kandiri, K., Minhaji, M., & Alehirish, M. H. M. (n.d.). Human Values Based on Pancasila Viewed from Islamic Education. *Al-Hayat: Journal of Islamic Education*, *8*(2), 539–549.

Hosaini, H., Qomar, M., Kojin, K., & Sibilana, A. R. (n.d.). Integration of School Curriculum and Islamic Boarding Schools in Preparing the Golden Generation with holistic intelligence. *SHS Web of Conferences*, *205*, 3001.

In'am, A., & Hajar, S. (2018). Peningkatan Kemampuan Metakognitif dan Pemecahan Masalah Matematis Melalui Pembelajaran Berbasis

Masalah. *Jurnal Pendidikan Matematika*, *6*(1), 1–14.

In'am, A., & Hajar, S. (2019). Peningkatan Kemampuan Metakognitif dan Pemecahan Masalah Matematis Melalui Pembelajaran Berbasis Masalah. *Jurnal Pendidikan Matematika*, *6*(1), 1–14.

Mawardi, M., Yanti, F., & Arrifadah, A. (2019). Analisis Proses Metakognitif Mahasiswa dalam Menyelesaikan Soal HOTS Ditinjau dari Gaya Kognitif. *Jurnal Pendidikan Matematika*, *14*(2), 123–134.

Mawardi, M., Yanti, F., & Arrifadah, A. (2020). Analisis Proses Metakognitif Mahasiswa dalam Menyelesaikan Soal HOTS Ditinjau dari Gaya Kognitif. *Jurnal Pendidikan Matematika*, *14*(2), 123–134.

Minhaji, M., Hosaini, H., Prasetiyo, N. T., Maktumah, L., & Alehirish, M. H. M. (n.d.). Responsive Islamic Education in Exploring Social Values Through the War Takjil Phenomenon: Sociological Perspective in Indonesia. *Jurnal Indo-Islamika*, *14*(1), 51–61.

Mutia, & Septiana, A. (n.d.-a). Pengembangan Modul Matematika Dasar Berbasis HOTS (Higher Order Thinking Skills) dengan Konteks Keislaman. *Algoritma Journal of Mathematics Education*, *4*(1), 31–45. https://doi.org/10.15408/ajme.v4i1.25008

Mutia, & Septiana, A. (n.d.-b). Pengembangan Modul Matematika Dasar Berbasis HOTS dengan Konteks Keislaman. *Algoritma Journal of Mathematics Education*, *4*(1), 31–45.

Ngilawajan, D. (2021). Pengaruh Gaya Kognitif terhadap Kemampuan Pemecahan Masalah Matematika. *Jurnal Pendidikan Dan Pembelajaran Matematika*, *4*(1), 45–52.

Ngilawajan, D. (2022). Pengaruh Gaya Kognitif terhadap Kemampuan Pemecahan Masalah Matematika. *Jurnal Pendidikan Dan Pembelajaran Matematika*, *4*(1), 45–52.

Rui, L. (2022a). Examining Foreign Language Listening Anxiety and Its Correlates: A Meta-Analysis. *Porta Linguarum*, *2022*(38), 99–117. https://doi.org/10.30827/portalin.vi38.22173

Rui, L. (2022b). Examining Foreign Language Listening Anxiety and Its Correlates: A Meta-Analysis. *Porta Linguarum*, *9*(38), 99–117. https://doi.org/10.30827/portalin.vi38.22173

Rustaman, N. Y. (2019). Pendidikan dan Penelitian Sains dalam Mengembangkan Keterampilan Berpikir Tingkat Tinggi untuk Pembangunan Karakter. *Prosiding Seminar Nasional VIII Pendidikan Biologi*, *8*(1), 15–34.

Rustaman, N. Y. (2020). Pendidikan dan Penelitian Sains dalam Mengembangkan Keterampilan Berpikir Tingkat Tinggi untuk Pembangunan Karakter. *Prosiding Seminar Nasional VIII Pendidikan Biologi*, *8*(1), 15–34.

Suryapuspitarini, H., Wardono, & Kartono. (2019). Pengembangan Modul Matematika Berbasis HOTS untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Unnes Journal of Mathematics Education Research*, *7*(2), 123–130.

Suryapuspitarini, H., Wardono, & Kartono. (2022). Pengembangan Modul

Matematika Berbasis HOTS untuk Meningkatkan Kemampuan Berpikir Kritis Siswa. *Unnes Journal of Mathematics Education Research*, *7*(2), 123–130.

Wulan, E. R., Lisahada, K. A., Nurkomalasari, I., & Afis, S. (n.d.). Analisis Keterampilan Berpikir Kreatif dan Level Metakognitif Siswa Terkait Menyelesaikan Masalah Tipe HOTS. *Indiktika: Jurnal Inovasi Pendidikan Matematika*, *4*(1), 1–12.

Wulan, E. R., Lisahada, K. A., Nurkomalasari, I., & Afis, S. (2018). Analisis Keterampilan Berpikir Kreatif dan Level Metakognitif Siswa Terkait Menyelesaikan Masalah Tipe HOTS. *Indiktika: Jurnal Inovasi Pendidikan Matematika*, *4*(1), 1–12.