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Metacognition Analysis of Male Junior High School Students in Problem Solving Oriented to the Ethnomathematics of East Java Joglo Houses

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ABSTRACT

The purpose of this study was to describe the metacognition of male junior high school students in problem solving oriented to the ethnomathematics of East Java joglo houses so that this research is a qualitative descriptive study, while the subject of this research is 1 male subject of SMP Negeri 2 Paciran. The data collection technique in this study uses test and interview techniques, where the test used is a problem solving test oriented to East Java joglo house ethnomathematics, then the test results and interviews are analyzed based on indicators of metacognition in problem solving. The validity of the data in this study uses time triangulation where the results of the first test and interview are compared with the results of the second test and interview until valid and reliable data are obtained with different time periods. While the data analysis method in this study consists of data reduction, presenting data, and drawing conclusions. The results of this study indicate that the metacognition of male junior high school students in solving problems oriented to East Java Joglo House Ethnomathematics at the stage of understanding the problem, and implementing a problem solving plan fulfills all indicators of metacognition, namely planning, monitoring and evaluation. However, at the stage of planning problem solving, male junior high school students do not fulfill the planning indicator because students do not plan the time used to solve the problem as well as at the stage of re-examining the solution obtained by male junior high school students do not fulfill the planning and monitoring indicators because they do not plan and monitor the problems given with different strategies or methods.
Keywords: *Metacognition, Problem Solving, Ethnomathematics, Gender*

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INTRODUCTION

An effective learning process requires active two-way interaction or communication between teachers and students. According to Nana Sudjana in (Harahap & Suwarno, 2023) explained that in interaction and communication, teachers play a crucial role in giving and receiving actions, while students receive and give actions, meaning that students can respond to the information provided by the teacher. However, it cannot be denied that in communication, conceptual errors often occur when students receive information. In this case, awareness and control are crucial during the information-gathering process. A person's awareness of their thinking process and how to control it is called metacognition. In line with the opinion of (Tohir, 2019) that metacognition plays an important role in regulating and controlling an individual in learning and thinking.

Metacognitive awareness can help students become aware of their thinking, allowing them not only to remember concepts and principles of mathematics and science but also to understand them accurately. Metacognition plays a crucial role in learning. Therefore, teachers need to understand students' metacognitive abilities in learning, so that teachers can investigate the extent of students' mathematical understanding and how well students can solve problems. According to Setyaningrum & Mampouw (2020), metacognition skills can occur if students have systematically carried out problem solving steps. Problem solving is at the heart of mathematics, so it should not be separated from the mathematics learning process. In compliance with Kartika and Firmansyah (2019), mathematical problem solving skills must be taught to students to optimize their thinking skills.

Thinking skills cannot be separated from the ability to manage information knowledge resources that students already have because problem solving ability includes a mental activity or individual effort that is directly organized to face and find the correct solution to a problem. In the world of education, there are still many students who have difficulty in solving problems, especially in finding problems to evaluating existing problems (Atmaja, dkk, 2024). Based on (Midawati, 2022), students have difficulty in problem solving starting from difficulty understanding the problem, planning the plan, implementing the plan and looking back. In facilitating problem solving, students can use several strategies or problem solving steps can be taken so that students are more directed and organized. Polya (1981) concluded that there are four processes must be done in solving problems, namely understanding the problem (*understanding the problem*), planning to solve the problem (*devising a plan*), implementing the problem solving plan (*carrying out the plan*), re-examining the solution obtained (*looking back*). The indicators of metacognition in problem solving

Problem Solving Stage	**Aspects of Metacognition**	**Indicator**
Understanding the problem (*understanding the problem)*	*Planning*	1. Determine what is known in the given problem. 2. Determining the question in the given problem. 3. Explaining the problem in your own language or another form.
	Monitoring	1. Monitor what is known in the given problem. 2. Monitoring the question in the given problem according to the original intention. 3. Monitor the language used in the given problem according to the original intention.
	Evaluation	1. Deciding the data obtained, i.e. what is known is correct. 2. Deciding the data obtained, namely what is asked in accordance with the original intention. 3. Deciding that when presenting the problem in your own language or other forms is in accordance with the original intention of the problem.
Planning problem solving (*devising a plan*)	*Planning*	1. Thinking about the relationship between what is known and what is asked. 2. Thinking about finding some appropriate strategies / ways to solve the given problem. 3. Thinking of mathematical concepts that can help him/her in solving the problem. 4. Planning the time used to solve the problem.
	Monitoring	1. Monitoring the relationship between what is known and what is asked is correct. 2. Monitoring the right strategy/way to solve the given problem. 3. Monitoring the mathematical concepts used are appropriate.
	Evaluation	1. Deciding that the relationship between what is known and what is asked is right. 2. Deciding on the right strategy or way to solve the given problem. 3. Deciding that the mathematical concept used is appropriate to solve the given problem.
Carrying out the problem solving plan (*carrying out the plan*)	*Planning*	1. Planning to execute the chosen strategy/method 2. Planning to make corrections when finding mistakes.
	Monitoring	1. Monitoring whether each step in the answer given is correct or not. 2. Monitoring whether the correction steps are on the right track or not.
	Evaluation	1. Deciding that each step in the answer is correct 2. Deciding that the correction is appropriate and able to correct the error.
Rechecking	*Planning*	1. Planning to recheck the accuracy of the answer

the solution obtained (*looking back*)		is obtained following what was asked. 2. Planning the given problem can be solved with different strategies/ways.
	Monitoring	1. Rechecking the accuracy of the answer is obtained following what was asked. 2. Monitoring the selection of different strategies/ ways in the given problem.
	Evaluation	1. Deciding the accuracy of the answer is obtained following what was asked. 2. Deciding it can be solved with different strategies/ways in the given problem. 3. Deciding that the strategy/method used is effective in solving a given problem.

Source: (Wulansari et al., 2022)

This method can simplify math problem solving for students, thereby lessening their difficulties. Likewise, the role of using several learning techniques, one of which is the use of a method of combining culture and mathematics, also known as ethnomathematic.

The nature of mathematics tends to be linear and rigid; however, when it is implemented with something soft like culture, that thinking will also become flexible. The role of ethnomathematics is quite important in mathematics education (Cahyani & Budiarto, 2020). Mathematics and culture grow in tandem within a community so that a person's mathematical ability is influenced by their cultural background (Mardhiyyah, dkk, 2024). The diverse culture in Indonesia means that its application is also very varied. As one of the people from East Java in the construction of joglo houses. The building of the house features classic Javanese characteristics with high architectural value. In the structural elements such as columns, doors, and roofs of the Joglo House. There are geometric concepts that can be implemented in mathematics education on topics such as flat shapes, solid shapes, similarity, congruence, pythagoras, and geometric transformations (Sulistyani et al., 2019).

The relationship between culture and mathematics is an important step in understanding the ways of thinking in various forms of mathematics, which can make it easier for students to understand mathematics. Research on metacognition in problem solving has been conducted by (Safitri et al., 2020) titled "Analysis of Students' Metacognitive Abilities in Solving PISA Model Mathematics Problems." the results showed that students with very good metacognition and those with good metacognition in solving PISA model problems were classified as moderate because they had not maximized the aspects of metacognition, while students with poor metacognition in solving PISA problems were classified as low because almost all aspects of metacognition were not adequately considered. In addition, in the study (Lusiana et al., 2020) titled "Students' Metacognitive Abilities in Solving Problems on Number Patterns Viewed from *Brain Dominance*". The results of the research are (1) subjects with *left brain dominance* meet three aspects of metacognitive abilities, namely developing planning, monitoring implementation, and evaluating actions. Among these three aspects, students with left brain dominance exhibit a level of *reflective use* of metacognitive abilities. (2) subjects with *right brain dominance* also meet three

aspects of metacognitive abilities, which are developing planning, monitoring implementation, and evaluating actions. Among these three aspects, students with right brain dominance demonstrate levels of *aware use* and *strategic use* of metacognitive abilities. Based on the explanation above and several previous studies, there has yet to be any discussion regarding issues related to culture or ethnomathematics. Therefore, the researcher is interested in conducting a study on "Analysis of Junior High School Students' Metacognition in Problem Solving Oriented to the Ethnomathematics of the Javanese Joglo House." The aim is to describe the metacognition of male junior high school students in problem solving oriented to the ethnomathematics of the Javanese Joglo House.

Research Method

The purpose of this research is to describe the metacognition of male junior high school students in problem solving oriented to the ethnomathematics of the Javanese Joglo house of East Java. Therefore, this research is a qualitative descriptive study, also referred to as the interpretive method, because the data obtained from the research leans more towards the interpretation of the data found in the field. This research was conducted at SMPN 2 Paciran in class VIII E, focusing on one male student who has good mathematics and communication skills. In this study, the researcher used data collection techniques of tests and interviews. The test used is a problem solving test oriented to the ethnomathematics of the Javanese Joglo house of East Java, which has undergone validity testing. The interview was conducted as a complement to the written test with the aim of uncovering more detailed issues. Therefore, this study uses two types of data: written test data and interview test data. Activities in qualitative data analysis are conducted interactively and continuously, so the data analysis technique in this research adopts the Miles and Huberman analysis technique, which is carried out in three stages namely data reduction, data presentation, and conclusions.

RESULTS AND DISCUSSION

The following is attached to the ethnomathematics problem solving test questions I and II used in this study.

Rumah Joglo Jawa Timur

Rumah adat joglo Jawa Timur umumnya terbuat dari kayu jati. Bangunan ini merupakan warisan leluhur, yang memiliki ciri khas Jawa klasik dengan nilai arsitektur kelas tinggi. Sebutan joglo mengacu pada bentuk atapnya, mengambil stilasi bentuk sebuah gunung. Rumah hunian atau sebagai tempat tinggal, atapnya terdiri 2 tajug disebut joglo / juglo / tajung loro. Saat penggambaran sketsa rumah joglo Jawa Timur setiap bagian tajug rumah joglo memiliki rata – rata ukuran diantaranya brunjung 13 cm dengan Panjang alas 6 cm, dan panjang molo 20 cm dengan alas 30 cm.

Adapun gambar sketsa dari rumah joglo Jawa timur tampak depan, tampak atas.

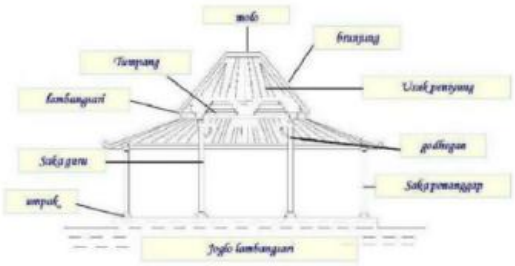
Jenis – jenis bangun datar apa saja yang menyusun bangunan tajug pertama tersebut? Gambarkan menjadi satu bangun datar pada tajug pertama dan carilah luasnya!

Figure TPME I

Rumah Joglo Jawa Timur

Rumah adat joglo Jawa Timur umumnya terbuat dari kayu jati. Bangunan ini merupakan warisan leluhur, yang memiliki ciri khas Jawa klasik dengan nilai arsitektur kelas tinggi. Sebutan joglo mengacu pada bentuk atapnya, mengambil stilasi bentuk sebuah gunung. Rumah hunian atau sebagai tempat tinggal, atapnya terdiri 2 tajug disebut joglo / juglo / tajung loro. Saat penggambaran sketsa rumah joglo Jawa Timur setiap bagian tajug rumah joglo memiliki rata – rata ukuran diantaranya molo 14 cm, brunjung atas 25 cm dengan alas 28 cm, dan brunjung bawah 10 cm dengan tinggi 8 cm, dan juga tinggi dari saka penggarep 20 cm.

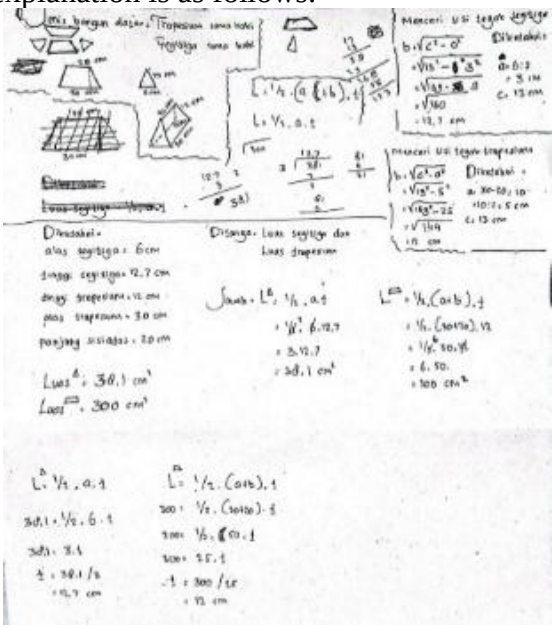
Adapun gambar sketsa dari rumah joglo Jawa timur tampak depan.



Coba perhatikan gambar sketsa rumah joglo tampak depan. Jenis – jenis bangun datar apa saja yang menyusun bangunan tersebut? gambarkan menjadi satu semua bangun datar yang terlihat, dan carilah luasnya!

Figure TPME II

From the questions, data from written tests was obtained, which the researcher used to obtain an overview of the metacognition of male junior high school students in problem solving oriented to the ethnomathematics of the Javanese Joglo House of East Java. The explanation is as follows:



Result Images TPME I

Result Images TPME II

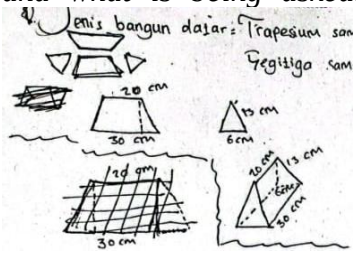
Understanding the Problem

The male subject described initial strategies for understanding the problem and gathering the necessary information to solve it, such as creating a sketch and then labeling it with numbers for easier comprehension. The subject also monitors the things that are known and asked about, and can also track other information from the questions, such as the fact that the questions also tell about the Joglo house from East Java. Finally, the subject decided that the information

to be used could solve the problem, and could also detail the data using their own language. There are excerpts from the interview and also written tests related to the explanation above.

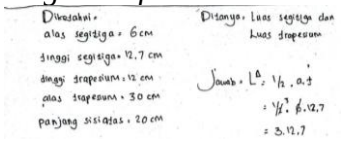
P : *What do you do to understand the questions?*

S : *Reading, depicting it in flat shapes form, and also identifying what is known and what is being asked.*



P : *In that questions, what is known and what is asked?*

S : *What is asked is the total area of the flat shapes, while what is known are the dimensions of the length of the house.*

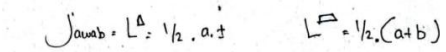


Devising Plan

The male subject had explained the initial strategy to solve the problem by writing down the triangle area formula and trapezoid area formula that he had understood before. However, he could not think of the time needed to work on the problem. The subject monitored the relationship between what was known and what was asked, ensuring that the concepts used were appropriate. Then, the subject concluded that there was a relationship between what was known and what was asked, and wrote down the formula used to solve the problem. The following are excerpts of interviews and also written tests related to the explanation above.

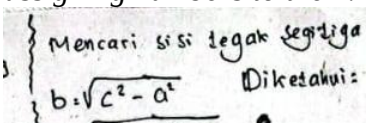
P : *What are the formulas for the area of a triangle and the area of a trapezoid?*

S : *The formula for the area of a triangle is* $\frac{1}{2}\ x\ a\ x\ t$ *and the area of trapezoid is* $\frac{1}{2}\ x\ (a + b)\ x\ t$



P : *After you know the formulas, what do you do?*

S : *Firstly, I am looking for the vertical side using the Pythagorean theorem, and also drawing each flat shape and assigning numbers to them.*



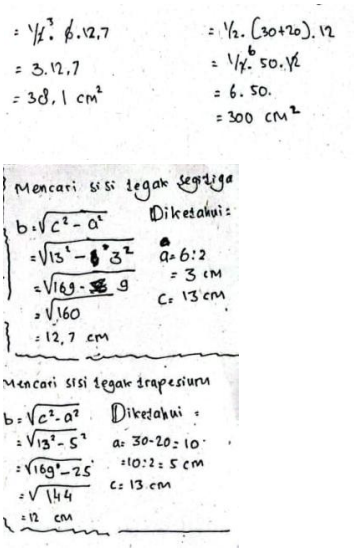
Carrying Out the Plan

The male subject was aware of the strategic plan used and had another plan in case of any mistakes. The subject also realized the importance of monitoring each step in answering the questions and keeping track of any improvements while deciding to write down the answers using the formulas and steps that have been planned. Additionally, the subject acknowledged the mistakes made and made corrections, even though the subject forgot to provide the total area answer. However, the solution is consistent with the drawing method, also using the Pythagorean theorem. There are excerpts from the interview and also written tests related to the explanation above.

P : *Could you describe the steps involved in entering the numbers until finished?*

J : *I started by reading the question, I knew that the vertical side of the triangle and trapezoid was nonexistent, so I searched*

and found the triangle measuring 12.7 and the trapezoid measuring 13. After that, I entered all the numbers into the formula and got the area of the triangle as 38.1 and the area of the trapezoid as 300.

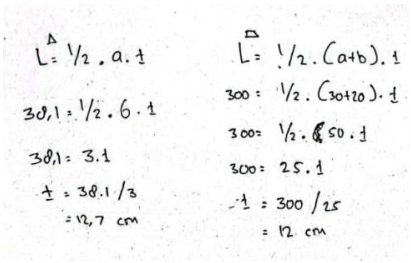


Looking Back

The male subject has realized the importance of planning to check the answers obtained in accordance with the questions asked, and explaining the reasons for the answers received; however, the subject did not plan to use other strategies. Additionally, the subject has acknowledged the need to recheck the accuracy of the obtained answers but did not monitor the selection of alternative strategies. Furthermore, the subject has decided that the strategy used is effective in resolving the given problems. In addition, the subject has also provided evidence in reviewing the answers. There are excerpts from the interview and also written tests related to the explanation above.

P : *How do you check the accuracy of your answers?*

S : *I wrote the initial formula with the area already known, just looking for the height, and the result is the same.*



The result of this study has shown that the metacognition of the male junior high school student in solving problems at the stage of understanding the problem involves describing initial strategies by gathering the necessary information to solve the problem. Subsequently, the subject monitors the findings as well as other information and then decided to write down in detail the information obtained using his language. In line with the research conducted by Weni et al., (2019), which stated that the metacognition of male subjects in understanding problems involves expressing or explaining them clearly and in detail. This indicates that the male junior high school student has reached the metacognitive indicators for understanding problems. At the stage of planning problem solving, the male subject describes the initial strategies or formulas that will be used and then monitors the relationship between what is already known and what is being asked. Then, the subject realizes the need to make a decision to write down the formulas or strategies that will be used to solve the problem, but the subject cannot think of the time frame for completing the task. This research shows that a male junior high school student has not yet met the metacognition in planning at the problem solving planning stage. This is in line with research (Safitri et al., 2020), which has explained that students have difficulty planning the time used to complete questions

because they do not observe the duration.

Furthermore, at the stage of implementing the problem solving plan, the male subject realizes the strategies used and also plans for improvements if there are mistakes. After that, the subject monitors the steps in executing the strategy and also oversees the corrections that will be made. All of this is carried out by writing numbers into the predetermined formulas and making the corrections accurately. This is in line with the research (Fatima et al., 2021) , which explained that at the stage of implementing the problem solving plan, male students were aware of and understood each step of the solution, indicating that male students have achieved the metacognition indicators in executing the problem solving plan. The explanation above can be concluded that male junior high school students meet the metacognition indicators in carrying out the problem solving plan.

In the final stage, reviewing the solution obtained, the male subject realized to plan to re-examine even though the subject did not have a plan to find another strategy. After that, the subject concluded that the strategy that had been used was effective, and he was able to provide evidence for the answer given. Contradictory to (Wulansari et al., 2022) that students can use metacognitive skills to review the solutions they have obtained. It can be concluded that male junior high school students are unable to perform metacognition effectively when reviewing the provided solutions because they do not meet the indicators of planning and monitoring.

CONCLUSION

Based on the results of the data analysis and discussion previously explained regarding the metacognition of male junior high school students in solving problems oriented to the ethnomathematics of the Javanese Joglo house, the conclusion is that the metacognition of the male junior high school students in solving problems oriented to the ethnomathematics of the Javanese Joglo House at the stage of understanding the problem and implementing the problem solving plan fulfills all metacognition indicators, namely planning, monitoring, and evaluation. However, in the planning stage of problem solving, the male junior high school students do not meet the planning indicator because the subjects cannot estimate the time needed for completion. Similarly, at the stage of rechecking the obtained solutions, the male junior high school students do not meet the planning and monitoring indicators because the subjects lack the thought process and do not monitor to seek alternative strategies to solve the problems.

REFERENCES

Atmaja, T. A., Santosa, T. A., Sakti, B. P., Yustitia, V., Kurniawan, A., Meriyati, M., & Ali, M. (2024). Meta-Analysis Problem Based Learning on Students' Problem-Solving Skills in Higher Education. *eScience Humanity Journal*, *4*(2), 477-484.

Cahyani, D. D., & Budiarto, M. T. (2020). Etnomatematika : Eksplorasi Prasasti Peninggalan Kerajaan Di Jawa Timur. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *4*(2), 673–689. Https://Doi.Org/10.31004/Cendekia.V4i2.289

Fatima, S. N., Munawwir, Z., & Kartika Sari, L. D. (2021). Analisis Kemampuan Metakognisi Siswa Dalam Pemecahan Masalah Menggunakan Soal TIMSS Ditinjau

Dari Perbedaan Gender. *Jurnal Pendidikan Dan Kewirausahaan*, *9*(2), 349–366. Https://Doi.Org/10.47668/Pkwu.V9i2.227

Harahap, Suwarno, M. (2023). *Komunikasi Dua Arah Sebagai Interaksi Edukatif Dalam Kisah Nabi Ā Dam Alaihi Al-Salam (As)*. *6*(2), 230–247.

Kartika, H., & Firmansyah, D. (2019). Peran Kesadaran Metakognitif Terhadap Kemampuan Pemecahan Masalah Matematis. Jurnal Theorems (The Original Research Of Mathematics), 3(2), 99–104. Http://Dx.Doi.Org/10.31949/Th.V3i2.1183

Lusiana, R., Murtafiah, W., & Oktafian, F. (2020). Kemampuan Metakognitif Siswa Dalam Menyelesaikan Permasalahan Pada Materi Pola Bilangan Ditinjau Dari Brain Dominance. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *9*(4), 962. Https://Doi.Org/10.24127/Ajpm.V9i4.3044

Mardhiyyah, I., Yustitia, V., & Kusmaharti, D. (2024). Pengembangan Media Flat Math Bebasis Etnomatematika pada Materi Bangun Datar di Sekolah Dasar. *Jurnal Arjuna: Publikasi Ilmu Pendidikan, Bahasa dan Matematika*, *2*(5), 356-369.

Midawati, M. (2022). Analisis Kesulitan Siswa Dalam Menyelesaikan Soal Pemecahan Masalah Berdasarkan Langkah Polya. *Jurnal Educatio FKIP UNMA*, *8*(3), 831–837. Https://Doi.Org/10.31949/Educatio.V8i3.2589

Polya, G. (1981). How To Solve It. Princenton University Press. New Jersey Princenton

Safitri, P. T., Yasintasari, E., Putri, S. A., & Hasanah, U. (2020). Analisis Kemampuan Metakognisi Siswa Dalam Memecahkan Masalah Matematika Model PISA. *Journal Of Medives : Journal Of Mathematics Education IKIP Veteran Semarang*, *4*(1), 11. Https://Doi.Org/10.31331/Medivesveteran.V4i1.941

Setyaningrum, D. U., & Mampouw, H. L. (2020). Proses Metakognisi Siswa SMP dalam Pemecahan Masalah Perbandingan Senilai dan Berbalik Nilai Mosharafa : Jurnal Pendidikan Matematika Mosharafa : Jurnal Pendidikan Matematika. Mosharafa: Jurnal Pendidikan Matematika, 9(2),275-286. https://journal.institutpendidikan.ac.id/index.php/mosharafa/article/view/mv9n2_09/5 90

Sulistyani, A. P., Windasari, V., Rodiyah, I. W., & Muliawati, N. E. (2019). Eksplorasi Etnomatematika Rumah Adat Joglo Tulungagung. *Media Pendidikan Matematika*, *7*(1), 22. Https://Doi.Org/10.33394/Mpm.V7i1.1537

Tohir, M. (2019). Keterampilan Berpikir Kreatif Siswa Dalam Menyelesaikan Soal Olimpiade Matematika Berdasarkan Level Metakognisi. *Alifmatika: Jurnal Pendidikan Dan Pembelajaran Matematika*, *1*(1), 1–14. Https://Doi.Org/10.35316/Alifmatika.2019.V1i1.1-14

Weni, R., Herlina, E., & Nari, N. (2019). Analisis Kemampuan Metakognisi Siswa Dalam Memecahkan Masalah Matematis Di Smpn 3 X Koto Singgalang Kabupaten Tanah Datar Ditinjau Dari Gender. *AGENDA: Jurnal Analisis Gender Dan Agama*, *2*(1), 43. Https://Doi.Org/10.31958/Agenda.V2i1.1990

Wulansari, K. T., Rohana, R., & ... (2022). Metakognisi Dalam Pemecahan Masalah Matematika Pada Siswa Kelas VIII SMP. *... Matematika*, *4*(2), 107–117.