JESE 3 (1) (2023)

Journal of Environmental and Science Education

https://journal.unnes.ac.id/sju/index.php/jese

Analysis of Metacognitive Ability of Middle School Students in Science Learning by Using Reflection Blogs

Kartika Fitri Astutik[1], Indah Urwatin Wusqo[1*]

[1]Science Education Study Program, Faculty of Mathematics and Natural Sciences, Universitas Negeri Semarang, Semarang, Indonesia 50229

DOI: https://doi.org/10.15294/jese.v3i1.60174

Article Info

Received 12 September 2022
Accepted 15 December 2022
Published 28 April 2023

Keywords:
Metacognitive Ability, Science Learning, Reflection Blogs

*Corresponding author:
Indah Urwatin Wusqo
Universitas Negeri Semarang
E-mail: urwatin@mail.unnes.ac.id

Abstract

This study aims to analyze the metacognitive abilities of junior high school students through reflection blogs. This study uses the type of research One-Shot Case Study. The sampling technique in this study used a purposive sampling technique. Based on the questionnaire data, metacognitive ability was obtained with an average score of 155.5 or 78.94% in class VIII A and metacognitive ability with an average score of 153.15 or 55%. Similar to the results of the questionnaire, the data for writing reflection blogs on students showed a score of 66% in class VIII A and 63% in class VIII B. Based on these data, it was found that the metacognitive abilities of class VIII A and class VIII B students were in the high category.

©2023 Universitas Negeri Semarang
p-ISSN 2797-0175
e-ISSN 2775-2518

INTRODUCTION

The development of the world in the 21st century is marked by an increase in all lines of life, both in the fields of technology and education. Over time, advances in information and communication technology in this century have changed people's lifestyles, both in terms of work, entertainment, and education. The characteristics of the 21st century are marked by the increasingly interconnected world of science, so that the synergy between them becomes faster. Access to learning in the 21st century has become easier, cheaper, faster and the information obtained is diverse. The presence of rapid advances in information technology should make it easier for junior high school (SMP) students to learn science. But in reality, students still have difficulty in learning science. Technology-based learning in the 21st century requires students to master several abilities. One of the important abilities in this century is metacognitive ability (Griffin et al., 2012).

One of the abilities that must be possessed by students in the 21st century is metacognitive ability. Education in the 21st century has identified self-directed learning as a basic skill that students must possess to prepare for education and jobs that are ready to compete for success in life and careers. Therefore, it is important to examine metacognitive thinking skills (Kodri & Anisah, 2020). Students who have metacognitive abilities will be able to organize their own learning activities. They have a way or strategy to solve the problem. This is in line with Sumampouw (2011) that metacognition is related to students' thinking and students' ability to use and apply appropriate strategies for learning.

The metacognitive itself is needed in successful learning, which allows students to know and organize their cognition knowledge and be able to see their weaknesses so they can improve on the next action. According to Sucipto (2017), metacognitive abilities allow students to increase awareness so that they can design, monitor, and evaluate or assess their learning outcomes. A supportive learning atmosphere and strategies in science learning are needed to improve metacognitive abilities so that students can develop themselves and express their ideas openly.

Iskandar (2014) defines metacognition as an ability that plays an important role in students' thinking and learning processes. Meanwhile, according to Schraw et al. (2006) metacognitive is included in the ability that allows students to be able to understand and monitor their own cognitive processes. Metacognition can be used as a learning approach by focusing on student learning activities, helping and guiding students if they have difficulties, and helping to develop self-concepts of what to do when learning science (Iskandar, 2014). Thus, the metacognitive ability of students can be an important element in the success of science learning. Metacognition has been defined as thinking about one's own thinking or the ability to plan, monitor, and evaluate student learning processes (Tanner, 2012). Reflection blogs facilitate students' metacognition through a reflective process in collecting evidence of their learning (Chen in Turky, 2017).

One of the facilities to determine students' metacognitive abilities is a reflection blog. Reflection blogs play an important role as a tool to document the learning process in self-development and help students to express their ideas openly without any influence from anyone. Martindale & Wiley (2005) say that reflection blogs are writings that contain the most interesting experiences of someone who writes them. Students can write down interesting experiences and ideas in the context of science learning that they have experienced at school. Interesting experiences experienced by students during learning can be in the form of understanding the concepts that they have learned or can also be in the form of difficulties in learning these concepts or solutions that can be overcome by students during learning. Thus, the task of writing a reflection blog can also be given to determine students' metacognitive abilities in learning science.

METHOD

The type of research used in this study is a One-Shot Case Study. This research was conducted at SMPIT Granada Tangerang, which is located at Jalan Ki Mulud No. 20, RT 03 RW 03, BojongJaya, Karawaci District, Tangerang City.

Banten. The population in this study were all students of class VII A – VII B, class VIII A – VIII B, and class IX A – IX B. The population used in this study were class VIII students in the even semester of the 2021/2022 academic year. The samples used in this study were class VIII

A students, totaling 20 students, and class VIII B students totaling 27 students. The sampling technique in this study used a purposive sampling technique. Data collection steps include (1) questionnaire method. Questionnaire sheets were used to measure students' metacognitive abilities in science learning. This inventory or questionnaire contains 52 statement items that are used to measure metacognitive abilities about knowledge of cognition and experience or regulation of cognition. (2) documentation method. Documentation is used to obtain data on the metacognitive abilities of junior high school students during science learning. The data obtained from the use of this technique comes from the reflection blogs of class VIII students of SMPIT Granada Tangerang. This paper contains instructions that are guided by the MAI instrument. Documentation in this study is the writings of student reflection blogs.

RESULT AND DISCUSSION

Description of the Subject Score Data for the Metacognitive Ability Questionnaire for Junior High School Students

The data from the metacognitive ability questionnaire that had been obtained were then analyzed by descriptive categorization and percentage methods. The results of the questionnaire data analysis showed the distribution of students' metacognitive abilities in five categories, namely very high, high, medium, low, and very low. Data on the subject scores of the metacognitive ability questionnaires for class VIII A students are presented on table 1.

Table 1 Categorization of MAI Questionnaire Subject Scores for Students VIII A

Category	Score	Frequency (F)	(%)
Very High	≥ 169	1	5.26
High	143 – 169	15	78.94
Medium	117 – 143	3	15.78
Low	91 – 117	0	0
Very Low	≤ 91	0	0
Total		19	100
Subject Score		2955	
Average Score		155,5	
Conclusion		High	

*N_A = 19

The data in table 1 shows that the metacognitive abilities of class VIII A students in science learning are in the high category with an average score of 155.5. In addition, based on table 1, it is known that there are 1 (5.26%) students with very high metacognitive abilities, 15 (78.94%) students in the high category, 3 (15.78%) students in the medium category, 0 (0%) students in the low category, and 0 (0%) students in the very low category. The distribution can be seen in Figure 1.

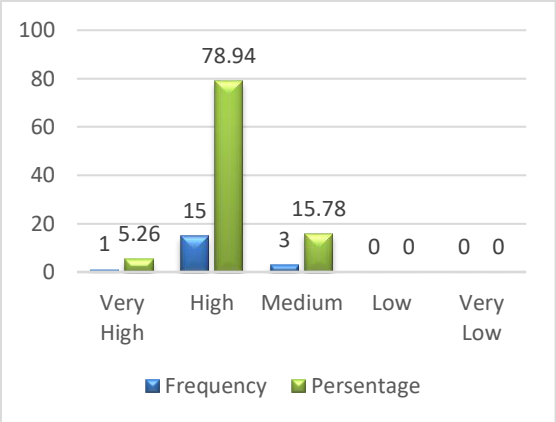

Figure 1 Categorization of Metacognitive Ability of Class VIII A Students

The same treatment was also carried out on students of class VIII B. Data on the score of the subject of the metacognitive ability questionnaire in class VIII B students are presented in table 2.

Table 2 Categorization of MAI Questionnaire Subject Scores for Students VIII B

Category	Score	Frequency (F)	(%)
Very High	≥ 169	3	15
High	143 – 169	11	55
Medium	117 – 143	6	30
Low	91 – 117	0	0
Very Low	≤ 91	0	0
Total		20	100
Subject Score		3063	
Average Score		153,15	
Conclusion		High	

*N_B = 20

The data in table 2 shows that the

metacognitive ability of class VIII B students in science learning is in the high category with an average score of 153.15. In addition, based on table 2, it is known that there are 3 (15%) students with very high metacognitive abilities, 11 (55%) students in the high category, 6 (30%) students in the medium category, and 0 (0%) students in the low category, and 0 (0%) students are in the very low category. The distribution can be seen in Figure 2.

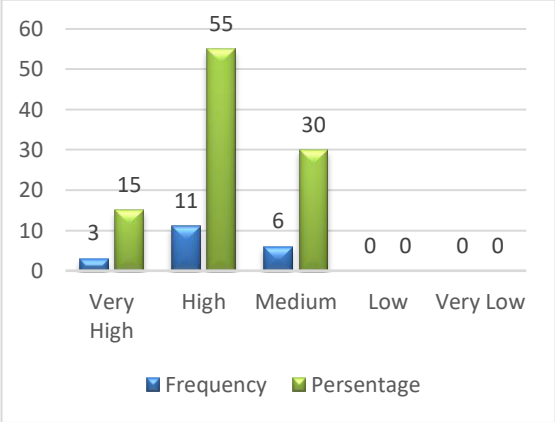

Figure 2 Categorization of Metacognitive Ability of Class VIII B Students

Description of Item Score Data (Item Items) Metacognitive Ability Questionnaire for Junior High School Students

In addition to subject scores, the metacognitive ability questionnaire also produces item score data.

Table 3 Categorization of MAI Questionnaire Item Scores for Class VIII A students

Category	Score	No. Item	(f)	(%)
Very High	≥ 61,75	**8**, **13**, 22, 25, 44	5	9,6
High	52,25 – 61,75	**1**, **2**, **3**, **4**, **6**, **7**, **9**, **10**, **12**, **14**, **15**, **16**, **17**, 18, **19**, **20**, 21, **23**, **24**, **26**, **27**, **28**, **30**, **32**, 33, 34, **35**, **36**, **37**, **38**, 39, 40, **41**, **42**, **43**, **45**, **46**, **47**, **48**, **49**, **50**, 51, **52**	43	82,69
Medium	42,75 – 52,25	**5**, 11, **29**, 31	4	7,69
Low	33,25 – 42,75	0	0	0
Very Low	≤ 33,25	0	0	0
Total			52	100

Similar to subject score data, item score data is also categorized into five categories, namely very high, high, medium, low, and very low. The item score data (item items) of the metacognitive ability questionnaire in class VIII A students are presented on table 3.

Based on the data in table 3, it is known that there are 5 (9.6%) items in the very high category, 43 (82.69%) items in the high category, 4 (7.69%) items in the medium category, 0 (0%) items in the low category, and 0 (0%) items in the very low category. The distribution can be seen in Figure 3.

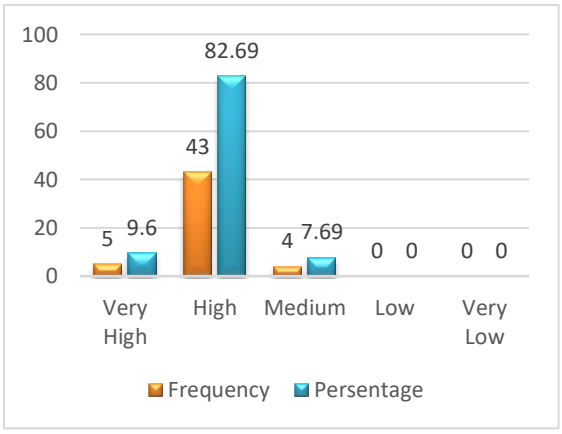

Figure 3 Categorization of MAI Questionnaire Item Scores for Class VIII A students

Item score data was also obtained from the questionnaire results for class VIII B students. Data item scores (items) for the metacognitive ability questionnaire for class VIII B students are presented in table 4.

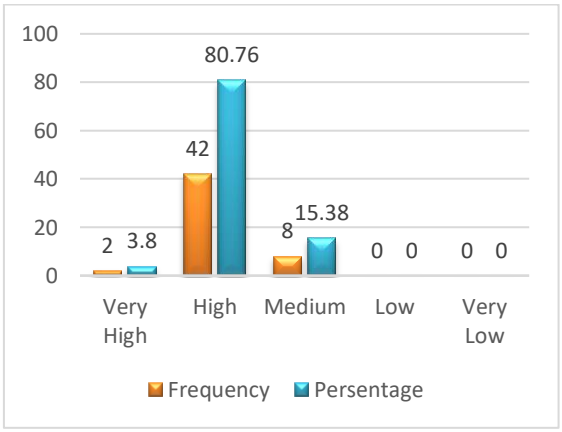

Figure 4 Categorization of MAI Questionnaire Item Scores for Class VIII B students

Table 4 Categorization of MAI Questionnaire Item Scores for Class VIII B students

Category	Score	No. Item	(f)	(%)
Very High	≥ 65	**8**, **13**	2	3,8
High	55 – 65	**1**, **2**, **3**, **4**, **6**, **7**, **9**, **10**, 11, **12**, **14**, **15**, **16**, **17**, **19**, **20**, 22, **23**, **24**, 25, **26**, **27**, **28**, **30**, 31, **32**, 33, **35**, **36**, **37**, **38**, **41**, **42**, **43**, 44, **45**, **46**, **47**, **48**, **49**, **50**, **52**	42	80,76
Medium	45 – 55	**5**, 18, 21, **29**, 34, 39, 40, 51	8	15,38
Low	35 – 45	0	0	0
Very Low	≤ 35	0	0	0
	Total		52	100

Based on table 4, it is known that there are 2 (3.8%) items in the very high category, 42 (80.76%) items in the high category, 8 (15.38%) items in the medium category, 0 (0%) items in the low category, and 0 (0%) items in the very low category. The distribution can be seen in Figure 4.

Identification of Data for Writing Reflection Blogs for Junior High School Students

The data for writing reflection blogs guided by Metacognitive Awareness Inventory (MAI) is presented in table 5.

Table 5 shows data on students' metacognitive abilities based on writing reflection blogs for classes VIII A and VIII B from the first meeting until the third meeting. Metacognitive abilities include aspects of cognition knowledge and cognition regulation. The results of data exposure show that the aspect of cognition knowledge has a score percentage of 59% in class VIII A and 61% in class VIII B.

Table 5 Reflection Blog Data for Class VIIIIA and Class VIII B

Indicator / Aspect	Class VIII A		Class VIII B	
	F	%	F	%
DK	8	42	9	45
PK	15	78	17	82
CK	11	58	11	56
Cognition Knowledge	**11**	**59**	**12**	**61**
Planning	17	88	16	77
IMS	11	56	10	50
Monitoring	10	54	12	57
IS	15	76	14	68
Evaluasi	17	88	14	71
Cognition Regulation	**14**	**72**	**13**	**65**
Metacogtive Ability	**12**	**66**	**12**	**63**

While the aspect of cognition regulation has a percentage score of 72% in class VIII A and 65% in class VIII B. So that it is obtained The results of writing a reflection blog based on Metacognitive Awareness Inventory (MAI) in class VIII A are 66% and 63% in class VIII B.

Aspects of Cognition Knowledge

Metacognitive ability consists of 2 aspects, namely aspects of cognition knowledge and aspects of cognition regulation. Based on data exposure, the results of the study indicate that the results of the questionnaire on aspects of cognition knowledge of class VIII A students are in the high category with an average score of 51.7. If broken down, there are 5% of class VIII A students in the medium category, 79% in the high category, and 16% in the very high category. While in class VIII B obtained an average score of 51.25 data. When broken down, there are 25% of students in the medium category, 65% in the high category, and 20% in the very high category. The cognition knowledge aspect includes 3 indicators, namely declarative knowledge indicators, procedural knowledge indicators, and conditional knowledge indicators.

The results of the questionnaire on the declarative knowledge indicator obtained an average score of 24.6 or 68.4% in class VIII A and an average score of 23.85 or 70% in class VIII B. The score is in the high category. The data on the procedural knowledge indicator has an average score of 11.5 or 42.1% in class VIII A and an average score of 12.15 or 40% in class VIII B. The score is included in the high category. Meanwhile, the conditional knowledge indicator

shows an average score of 15.6 or 57.89% in class VIII A and an average score of 15.25 or 70% in class VIII B.

The results on student questionnaires are similar to the results of writing student reflection blogs. The data on the research results show that the results of the reflection blog on aspects of cognition knowledge of class VIII A students 59% and 61% of class VIII B students. If the data is detailed, the data obtained are declarative knowledge indicators of 42% in class VIII A and 45% in class VIII A. class VIII B. The data on the procedural knowledge indicator has data of 78% in class VIII A and 82% in class VIII B. While on the conditional knowledge indicator, there is a score of 58% in class VIII A and 56% in class VIII B.

The highest score of cognition knowledge for class VIII A and class VIII B lies in procedural indicators. This means that class VIII B students are able to develop good strategies during learning. In this process, students show the activities that are being carried out during learning. For example, students listen and take notes on the material explained by the teacher, chat with friends, and discuss. This indicator, according to Setiawati & Corebima (2018) is knowledge about how to do something and how to carry out certain process steps in another sense, it means "how" to do something. Based on the description above, it can be concluded that the aspects of students' knowledge are included in the high category.

Aspects of Cognition Regulation

The results of the questionnaire on the aspect of cognition regulation showed that class VIII A students were in the high category with an average score of 103.7. If broke down, there would be 26% of class VIII A students in the medium category, 68% in the high category, and 6% in the very high category. While in class VIII B, the average score was 101.9. If broken down, there are 30% of class VIII B students in the medium category, 55% in the high category, and 15% in the very high category. The aspect of cognition regulation includes 5 indicators, namely planning indicators, information management strategy indicators (IMS), monitoring indicators, improvement strategy indicators (IS), and evaluation indicators. The results of the questionnaire on planning indicators obtained an average score of 21.3 or 68.4% in class VIII A and an average score of 20.3 or 50% in class VIII B. The score is in the high category. The information management strategy indicator (SMI) has an average score of 28.89 or 57.89% in class VIII A and an average score of 28.75 or 55% in class VIII B. The score is included in the high category. The data on the monitoring indicators have an average score of 20.6 or 63.1% in class VIII A and an average score of 19.9 or 45% in class VIII B. Indicators of improvement strategies obtained average data a score of 15.2 or 52.6% in class VIIA and an average score of 15.7 or 65% in class VIII B. Meanwhile, the evaluation indicators show an average score of 17.6 or 52.6% in class VIII A and an average score of 17.25 or 45% in class VIII B.

The results on student questionnaires are similar to the results of writing student reflection blogs. The data on the research results show that the results of reflection blogs on aspects of cognition regulation of class VIII A students are 72% and 65% of class VIII B students. If the data is detailed, the data obtained are planning indicators (planning) of 88% in class VIII A and 77% in class VIII B. Data on information management strategy (SMI) indicators have data of 56% in class VIII A and 50% in class VIII B. Data on monitoring indicators is 54% in class VIII A and 57% in class VIII B. The improvement strategy indicator has obtained data of 76% in class VIII A and 68% in class VIII B. While the evaluation indicator has a score of 88% in class VIII A and 71% in class VIII B. In the aspect of cognition regulation, the highest score for class VIII A lies in the planning and evaluation indicators. That is, in the planning indicator, class VIII A students are able to determine or plan a schedule for learning to estimate the time needed to complete learning tasks and take appropriate steps or decisions for learning strategies. In this process, students are able to write down the continuity of learning activities, and initial activities before learning begins.

According to Setiawati & Corebima (2018) planning is an activity that is carried out carefully to organize the entire learning process. Activities such as setting goals, learning steps, learning strategies, and learning expectations are included in this activity. While on the evaluation indicators, students are able to assess the process of their own learning outcomes by reviewing or revising the learning objectives. In this process, students are able to give advice to the teacher during the learning process so that students better understand the material presented by the teacher. Similar to (Kodri, 2020) evaluation is an activity that evaluates the independent learning process. In class VIII B the highest score is on the planning indicator. Based

on the description above, it can be concluded that the aspects of student cognition regulation are included in the high category.

Student Metacognitive Ability

Based on data exposure, the results of the study indicate that the results of the questionnaire on the metacognitive abilities of class VIII A students are in the high category with an average score of 155.5. In detail, 15.78% of class VIII A students are in the medium category, 78.94% in the high category, and 5.26% in the very high category. While in class VIII B, metacognitive ability data was obtained with an average score of 153.15. When detailed, there are 30% of students in the medium category, 55% in the high category, and 15% in the very high category.

Metacognitive ability includes 2 aspects, namely aspects of cognition knowledge and aspects of cognition regulation. The results of the questionnaire on aspects of cognition knowledge obtained an average score of 51.7 or 79% in class VIII A and an average score of 51.25 or 65% in class VIII B. The score is in the high category. Meanwhile, in the aspect of cognition regulation, the data shows an average score of 103.7 or 68% in class VIII A and an average score of 101.9 or 55% in class VIII B. The score is included in the high category.

The results on student questionnaires are similar to the results of writing student reflection blogs. The data on the results of the study show that the results of writing blogs reflect the metacognitive abilities of class VIII A students are 66% and 63% of class VIII B students. If the data is detailed, data on aspects of cognition knowledge was obtained by 59% in class VIII A and 61% in class VIII B. Meanwhile, in the aspect of cognition regulation, there is a score of 72% in class VIII A and 65% in class VIII B. The highest score in class VIII A and class VIII B was in the aspect of cognition regulation. That is, the ability of students to plan, manage, monitor, improve, and evaluate dominates more than the ability to remember certain knowledge, how to do things, and use the knowledge they have. This is similar to Schraw & Dennison (1994) experience or metacognitive regulation refers to a series of activities that help students to control their learning. Based on the description above, it can be concluded that students' metacognitive abilities are included in the high category.

CONCLUSION

Based on the results of research and data analysis that has been carried out, it can be concluded that students' metacognitive abilities based on research results in the form of student metacognitive questionnaires obtained an average score of 155.5 or 78.94% in class VIII A and an average score of 153, 15 or 55% in class VIII B. The data is included in the high category. Similar to the results of the research in the form of a questionnaire, the results of the research in the form of writing a reflection blog obtained data of 66% in class VIII A and 63% in class VIII B.

REFERENCES

Griffin, P., McGaw, B., & Care, E. (Eds.). (2012). *Assessment and Teaching of 21st Century Skills*. Springer Netherlands.

Iskandar, S. M. (2014). Pendekatan Keterampilan Metakognitif dalam Pembelajaran Sains di Kelas. *Erudio Journal of Educational Innovation*, *2*(2), 13–20.

Kodri, K., & Anisah, A. (2020). Analisis Keterampilan Metakognitif Siswa Sekolah Menengah Atas dalam Pembelajaran Ekonomi Abad 21 di Indonesia. *Edunomic Jurnal Pendidikan Ekonomi*, *8*(1), 9–19.

Martindale, T., & Wiley, D. A. (2005). Using weblogs in scholarship and teaching. *TechTrends*, *49*(2), 55–61.

Schraw, G., Crippen, K. J., & Hartley, K. (2006). Promoting Self-Regulation in Science Education: Metacognition as Part of a Broader Perspective on Learning. *Research in Science Education*, *36*(1–2), 111–139.

Schraw, G., & Dennison, R. S. (1994). Assessing Metacognitive Awareness. *Contemporary Educational Psychology*, *19*(4), 460–475.

Setiawati, H., & Corebima, A. D. (2018). Improving Students' Metacognitive Skills through Science Learning by Integrating PQ4R and TPS Strategies at A Senior High School in Parepare, Indonesia. *Journal of Turkish Science Education.*, *15*(2), 95–106.

Sucipto, S. (2017). Pengembangan Ketrampilan Berpikir Tingkat Tinggi dengan Menggunakan Strategi Metakognitif Model Pembelajaran Problem Based Learning. *Jurnal Pendidikan (Teori dan Praktik)*, *2*(1), 63–71.

Sumampouw, H. M. (2011). Keterampilan Metakognitif dan Berpikir Tingkat Tinggi dalam Pembelajaran Genetika (Artikulasi

Konsep dan Verifikasi Empiris). *Bioedukasi*, *4*(2), 23–39.

Tanner, K. D. (2012). Promoting Student Metacognition. *CBE – Life Sciences Education*, *11*(2), 113–120.

Turky, M. (2017). Enhancing Metacognition Skills by Using Reflective E-Portfolio. *SSRN Electronic Journal*.