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Implementation of the ASICC learning model to improve the metacognitive students' based on lesson study extracts

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ABSTRACT

This research is driven by observations from the eighth-grade class at Junior High School 5 Kertosono, which revealed that lesson planning, reading comprehension, and problem-solving strategies have not been effectively utilized. Therefore, this research aims to enhance students' awareness and metacognitive skills through the application of the ASICC learning model. The focus of this study is on 18 eighth-grade students at Junior High School 5 Kertosono. This research is classroom action research based on a lesson study conducted over two cycles. The data analysis used is the scores of metacognitive awareness and skills in the first cycle compared to the second cycle, tested using N-Gain analysis. The research results reveal that metacognitive awareness in the first cycle showed that 11.1% of students were in the "medium" category, which increased to 22.2% in the second cycle. Meanwhile, metacognitive skills experienced a significant increase in the "high" category, starting from 16.7% in the first cycle and rising to 33.3% in the second cycle. The ASICC learning model can be applied to enhance students' metacognition. Another finding reveals that students with good metacognitive awareness do not always possess good metacognitive skills.

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INTRODUCTION

Indicators of 21st-century educational success emphasize the ability to communicate, share, and use information to solve complex problems (Zubaidah, 2020). True learning is learning that not only provides knowledge and information to students but also encourages their ability to ask and find answers. Nevertheless, this practice is still rarely used, as the majority of teachers still apply teacher-centric lecture methods. Besides, Indonesia has a science education pattern that is mostly focused on concepts and less on reinforcing metacognitive skills. Since students are not trained to understand and empower their own cognitive abilities, the implication is that students' cognitive abilities are low (Djamahar et al., 2019). Education that focuses on instructors may be more effective in spreading a lot of knowledge in a very short time. However, some educational shortcomings focus on instructors, such as the student's inability to acquire analytical thinking skills and methodical approaches to problem-solving. Students are not encouraged to develop their own skills. And they are not allowed to set a goal and to evaluate what they do well (Ghafar, 2023).

Data collected from a study conducted by Jannah et al., (2023) at the Junior High School 5 Kertosono suggests students are still unable to create effective learning strategies for themselves, such as not being able to understand a read or information properly. They're also unable to make effective learning plans and evaluations. Evaluation is a continuous and recurring process that helps in determining the values of evaluation, educational status, and student achievement (Shinde, 2022). The findings suggest students have a low level of metacognitive awareness, especially in terms of planning, declarative knowledge, and information management strategies. This is because teacher-centered learning is still very frequently used. As a result, students will try to run away if they are tired of the teacher's style of lecture, so they will lag in one topic and face difficulties in the next.

The results of the AKM class examination conducted by KEMENDIKBUD also show that students still have difficulty understanding the purpose of the literacy and numeration questions given. Besides, they seem to be inclined to choose answers reasonably without reading the subject carefully. This is because teachers only concentrate on student worksheets (LKS), which still use type C1 and C2 questions with closed answers. These two categories are the lowest components of Bloom's taxonomy. As a result, they're not used to this type of open answer. Instead, to get a general picture of students' abilities in a particular field, additional testing on other cognitive components, such as analyzing, evaluating, and creating, which are part of the four dimensions of knowledge, is also required (Rahayu, 2018). With LKS, students should be able to undertake activities that are relevant to the material they are taught to train their cognitive skills. Therefore, to improve students' cognitive abilities, ask questions with open answers or use HOTS teaching to direct class activities so that they can explore or acquire students' personal knowledge. Contextual problem analysis and group discussion are two ways that can be used to carry out this activity. On the contrary, teachers are just facilitators of learning, not subjects of learning (Ulfah et al., 2023). Students must participate actively in the learning process, which means they must learn to plan, see, regulate, and control cognitive processes (Az-Zahra et al., 2021).

The above problem causes students to show symptoms of undeveloped metacognition. Metacognition allows a person to study and reflect on how his thoughts happen. Metacognition is simply referred to as "re-thinking what has been thought (Rahmadhni & Chatri, 2023). One of the causes of low metacognitive abilities is the use of learning methods that do not strengthen metacognition abilities. Therefore, learning methods or models can help students improve their metacognitive abilities (Erlin & Fitriani, 2019). By using proper learning design consistently and monitoring student progress, teachers can achieve optimal results by leveraging students' metacognitive abilities (Amin & Adiansyah, 2020). Metacognition awareness and skills are two things to keep in mind when improving metacognition. Metacognitive awareness helps people recognize what they know and what they don't know about tasks to be completed (Eriyani, 2020). Meanwhile, metacognitive skills are essential to regulate and control the cognitive processes involved in thinking and learning so that learning and thinking become more efficient and productive (Listiana et al., 2019).

Applying the appropriate learning methods, such as the ASICC learning model, is one way to realize such indicators. It is based on the learning of ASICC, which consists of several stages: adapting, searching, interpreting, creating, and communicating, thus helping students solve problems and improve their ability to think systematically. This model also teaches students to work together to solve problems in groups, as well as encourages learning in organized and structured groups (Santoso et al., 2021). Based on the above facts, collaborative skills can be developed or trained in learning so that students become professionals when they work in the real world (Hairida et al., 2021). Metacognition plays an important role in regulating and controlling the cognitive processes involved in thinking and learning.

Based on the issues that have been raised, efforts are needed to enhance metacognitive awareness and metacognitive skills among students. The implementation of action research based on lesson study can be an alternative to enhance the learning process. The reason for choosing action research is based on the result of observation in the schools that there was only one science teacher at that school. Learning needs to be developed collaboratively by several groups of teachers. In addition, the improvement of the quality of the learning process will be maximized if teachers collaborate on planning, implementing, and reflecting on the lessons together. Including how to improve students' metacognitive using lesson study (Shi & Cheng, 2021). Through lesson study, teachers can provide feedback based on their experiences (Roorda et al., 2024). Therefore, by conducting lesson study, teachers can learn from one another, leading to an improvement in the quality of learning.

One of the things that distinguishes this research from previous studies is that this research also compares metacognitive skills with students' metacognitive awareness, whereas previous studies have not extensively addressed research that juxtaposes these two aspects of metacognition.

RESEARCH METHODS

Research Design

This research is an initiation of class action based on lesson study by applying the ASICC learning model to improve students' awareness and skills. The instruments used in this study are a Metacognitive Awareness Inventory (MAI) questionnaire that is distributed with Google Forms, teaching modules, and student worksheets with ASICC stages, pretests, and posts, and application of research based on the model developed by Kemmis & McTaggart, (1988) presented in Figure 1.

Figure 1. Class action research cycle based on lesson study Model Kemmis & Taggart (1988)

Population and Samples

The study was conducted in September–November of the academic year 2023–2024. The subject of this study is a student in the 8th grade of the junior high school at 5 Kertosono, consisting of 18 students. Results from live observations in the classroom and interviews show that students have a low level of numerical literacy and the presence of low metacognitive symptoms. This is evidenced by the pre-test scores of the Minimum Competency Assessment (AKM), which show a score was 0 on literacy questions related to identifying effective keywords to find relevant information sources in informational texts. On the other hand, all students also face difficulties with numerical problems involving addition, subtraction, multiplication, and division of fractions or decimal numbers, as well as calculating simple probabilities and applying the Pythagorean theorem.

Instruments

The instruments used in this research include a questionnaire to measure metacognitive awareness adopted from Schrow and Dennison (1994), an instrument to measure metacognitive skills integrated with comprehension tests (cognitive) supported by the assessment rubric from Corebima (2009), which was then adjusted to a modified scale interval from Green (2002), teaching modules, and student worksheets (Table 1).

Table 1. Metacognitive Skills Section

Score	Description
0	no answers at all.
1	the answer is not in the sentence itself; the sequence of displaying the answer is less or less false and systematic, logical with less correct grammar (language), which is not accompanied by reasoning (analysis/evaluation, or creation), and the answer isn't true.
2	the answer is not in the sentence itself; the order of displaying the answer is less or less accurate and systematic, logical with less correct grammar (language), which is less accompanied by reasoning (analysis/evaluation, or creation), and the response is less correct.
3	the answer is not in the sentence itself; the order of displaying the answer is less or less accurate and systematic, logical with less correct grammar (language), which is less accompanied by reasoning (analysis/evaluation/creation) and the reply is true.
4	the answer is not in the sentence itself; the sequence of displaying the answer is chaotic and systematic, logical with the grammar (language) right, which is accompanied by the reasoning (analysis/evaluation/creation) and the reply is true.
5	the answer in the sentence itself, the sequence in which the answer is displayed, is blatant and systematic, logical with less correct grammar (language), which is accompanied by reasoning (analysis/evaluation, or creation), and that answer is true.
6	the answer in the sentence itself, the sequence of the display of the answer, is less accurate and systematic, less or less logical, with the grammar (language) less correct, which is accompanied by the reasoning (analysis/evaluation, or creation), and the reply is true.
7	the answer in the sentence itself, the sequence in which the answer is displayed, is smooth and systematic, logical with the grammar (language) right, which is accompanied by the reasoning (analysis/evaluation, or creation) and the answer's right.

These instruments were developed during the planning stage of the lesson study. Then, a focus group discussion (FGD) was conducted by the teachers of the science subject, the research team, expert lecturers in biology education, expert lecturers in biology, and supervising lecturers.

The purpose of the FGD is to assess the feasibility of the teaching materials and instruments that will be used. The results of the focus group discussion revealed that the teaching instruments and materials are deemed very suitable but need improvement. The instruments have been revised according to the recommendations from the FGD results (Table 2).

Table 2. Metacognitive Skill Scale Interval

Value Interval	Level	Name	Description
0-17	0	not yet	not leading to cognition
18-34	1	a lot less	it seems to have no consciousness of thinking as a process.
35-51	2	Less	unable to separate what he thinks from the way he is thinking
52-68	3	Growing	can help towards self-consciousness if supported.
69-85	4	Good	the conscious will think for himself and can distinguish between the stages of elaboration of input and output in his mind. sometimes using strategies to organize his thinking and learning.
86-102	5	very good.	able to use metacognitive skills regularly to regulate their own thinking and learning processes. be aware of the many possibilities of thinking, be able to use them, and reflect on the thinking process.

Procedures

The data collection began with an interview with natural science teachers in the 8th grade about the teaching and learning process, as well as direct observations of the difficulties encountered by teachers and students during the learning process. Students were asked to fill out the MAI lift to find out metacognitive awareness and pre-test previous material. This study consists of two cycles or six meetings, with four elements each: 1) Researchers and natural science teachers carry out the planning phase by preparing teaching modules, leaflets for teachers, and post-test issues to be given to students. 2) The action phase is carried out using the instruments that have been made, and the natural science teacher acts as a model teacher. 4) At the observation stage, two researchers acted as observers during the ASICC learning model, where the main task of the observers was to observe the classroom conditions when the learning began, as well as to note and record both photos and videos related to the responses of 18 eighth-grade students from Kertosono Junior High School during the learning process. 5) The phase of reflection is performed by the teacher and the researcher after the lesson material is completed to see how successfully the learning is implemented.

Data Analysis

The data analysis of this research is derived from data on awareness and metacognitive skills. The measurement of metacognitive awareness is conducted using a modified MAI questionnaire, which is divided into two types: knowledge about cognition and regulation of cognition. The rubric in the metacognitive questionnaire consists of scores on a scale of 0-3. The assessment rubric for the results of the metacognitive awareness questionnaire can be seen in Table 3.

Table 3. Metacognitive Awareness Rubric

Skor	Description		
0	TP	=	Never experienced as described in the statement.
1	JR	=	Rarely experiencing as described in the statement.
2	SR	=	Often experiencing according to the description of the statement.
3	SL	=	Always experiencing according to the description of the statement

The data collected from the MAI questionnaire was analyzed using average calculations with Microsoft Excel 2010 based on formulas.

$$\bar{x} \text{ student scores} = \frac{P}{TN}$$

Information:
TN =Total number
$\bar{x}$ student scores = Average student scores
P = Point

Meanwhile, the results of the metacognitive skills assessment were obtained from the post-test conducted by each student. The assessment is based on a rubric modified from Corebima (2009), which will be accumulated and converted into a score on a scale of 100 as per the following formula.

$$X = \frac{Y - \text{Min Score}}{\text{Max Score} - \text{Min Score}} \times 100$$

Information:
X = The value of metacognitive skills.
Y = The scores obtained by the students.

Next, to determine the level of metacognitive ability by matching the modified scale intervals from Green (2002). After all the stages are completed, the next step is normalization using the N-Gain formula and determining the criteria for the N-Gain values (Table 4).

$$\text{N} - \text{Gain} = \frac{\text{Post Test Score} - \text{Pre Test Score}}{\text{Maximum Score} - \text{Pre Test Score}}$$

Table 4. Creteria N-Gain

Normality Value Gain	Criteria
$0{,}70 \leq n \leq 1{,}00$	High
$0{,}30 \leq n < 0{,}70$	Moderate
$0{,}00 \leq n < 0{,}30$	Low

RESULTS

The results of the observation on the implementation of the ASICC learning model show that in the adapting stage of the first cycle, students were less focused on listening to the lesson and talking about things unrelated to the subject matter. The teacher then gave a reprimand and thought-provoking questions to the students. At the searching stage, students use their phones to open other applications that are not related to the lesson material, so the teacher must ensure that students are using their phones to look for additional information related to the lesson content.Because the students are not accustomed to the heterogeneous group system, at the interpreting stage, the male students appear to be more active compared to the female students. Therefore, the teacher posed several questions to stimulate the students' curiosity, and in the final stage, which is creating and communicating, the students were still shy to express their opinions and ask questions because they were afraid of making mistakes in their tasks and feared the feedback from other groups. As a result, the teacher's efforts included providing motivation to help them feel prepared and confident in delivering their presentations.

The second cycle shows an increase, with students more focused during the adaptation phase and wanting to ask questions about the material presented. At the searching stage, students become active and enjoy learning, as indicated by their observation results. Students have started using their phones to search for information related to the material, are accustomed to discussions related to practical work conducted in a heterogeneous manner, are able to present their work even though they sometimes use their local language, and are beginning to feel confident in asking questions and providing critiques and suggestions about the presentations of other groups.

In addition to the classroom observation results, there was an increase in the average metacognitive awareness of students, as obtained from the MAI questionnaire administered at the end of each cycle. What can be seen in Figure 2.

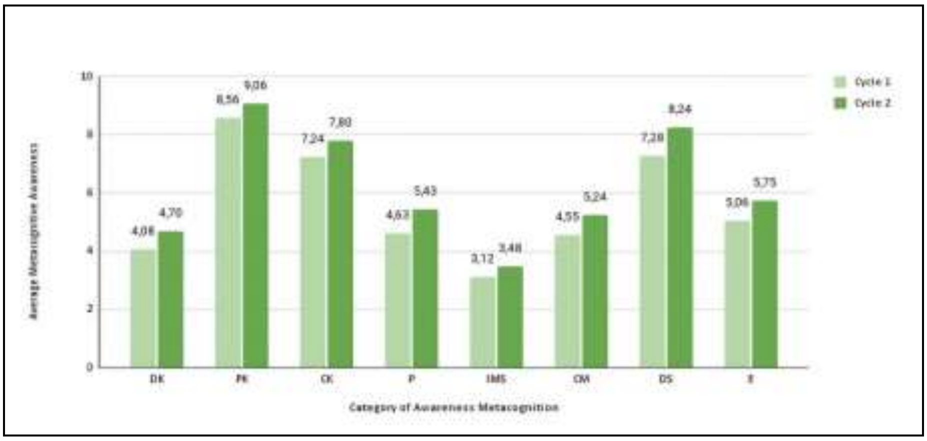

Figure 2. Average Metacognitive Awareness of Students

*DK=Declarative Knowledge; PK=Procedural knowledge; CK=Conditional knowledge; P=Planning; IMS=Information management Strategies; CM=Comprehension monitoring; DS=Debugging strategies; E=Evaluation.

In addition to the classroom observation results, there was an increase in the average metacognitive awareness of students, as obtained from the MAI questionnaire administered at the end of each cycle. This can be seen in Figure 2. The procedural knowledge category has the highest score compared to other categories. Students achieved an average score of 8.56 in the first cycle and an average score of 9.06 in the second cycle. Based on Figure 2, the debugging strategies in the first cycle had an average score of 7.28, which is lower than the second cycle's score of 8.24. This indicates that students were able to find the right strategies to correct their misunderstandings in learning, as they have started to bravely ask questions about material they do not understand and seek help from others to avoid confusion.

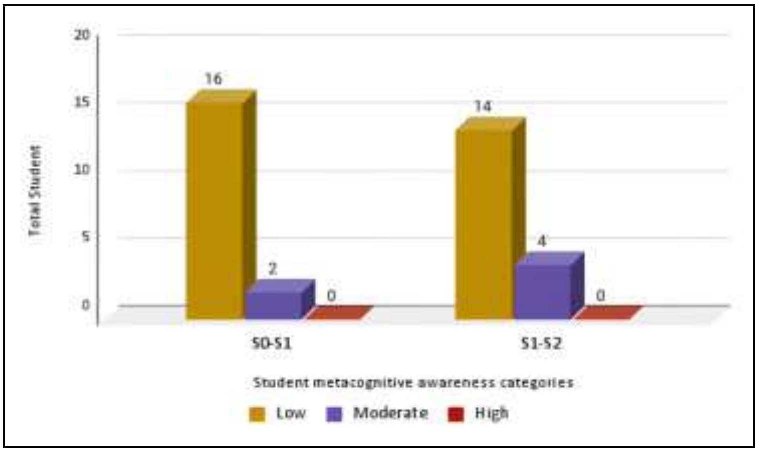

Figure 3. Results of N-Gain Metacognition Awareness Test Calculation.

The results of the metacognitive awareness test calculation based on Figure 3 show that 16 or 88.9% of students are still in the "low" category, while only 2 or 11.1% of students are in the "medium" position. After the ASICC learning was conducted over two cycles, the number of students experiencing metacognitive awareness in the "medium" category increased to 4 students, or 22.2%.

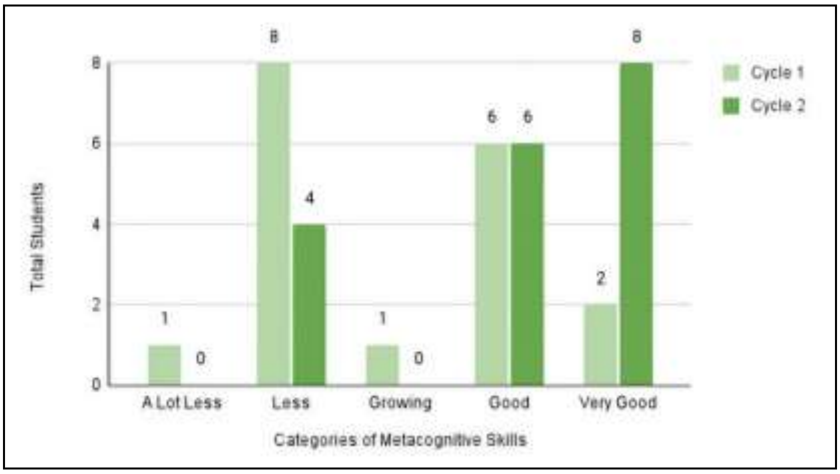

Figure 4. Results of the N-Gain Calculation For Metacognitive Skills.

Meanwhile, the number of students based on the results of the pre-test and post-test using the metacognitive skills assessment rubric and scoring with Green's scale can be seen in Figure 4. The implementation of the ASICC learning model conducted over two cycles shows a significant difference in students' metacognitive skills. The notable difference is evident in the "very good" category, where in the first cycle, 2 students, or 11.1% fell into this category, while in the second cycle, there was an increase to 8 students, or 44.4%.

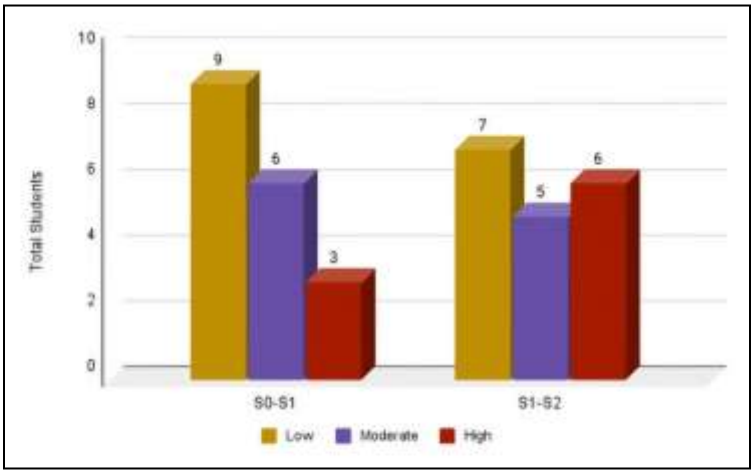

Figure 5. Metacognition Skills N-Gain Test Results Calculation.

The results of the N-Gain test calculations for metacognitive skills also show an increase, as can be seen in Figure 5. During the first cycle, there were 9 students, or 50%, in the "low" metacognitive skills category. The metacognitive skills in the "high" category showed a significant improvement. In the first cycle, there were 3 students or 16.7%, and in the second cycle, it increased to 6 students or 33.3%. This can also be observed during the learning process, especially in the stages of interpreting, creating, and communicating. Students are more active in asking questions and responding to the statements of the teacher and group members compared to the previous cycle. They also participate in practical sessions and focus more on the tasks assigned by the teacher.

Table 5. Presentation of the N-Gain Metacognition Analysis Results

Metacognition category	Metacognition awareness (%)	Metacognition skills (%)
Low	72,2	22,2
Low – Moderate	16,7	16,7
Moderate- Low	5,6	11,1
Moderate	5,6	5,6
Moderate – High	0	16,7
High – Moderate	0	5,6
Low – High	0	11,1
High – Low	0	5,6
High	0	5,6

The percentage results of the N-Gain acquisition from the data on metacognitive awareness and skills are presented in Table 5. The percentage of N-Gain analysis results on metacognitive awareness and skills from the two data sets revealed that students with high metacognitive awareness do not always possess high metacognitive skills as well. This can be seen in Table 5, which shows that students with low metacognitive awareness have a percentage of 72.2%, while students with low metacognitive skills have a percentage of only 22.6%. Furthermore, Table 5 indicates that 5.6% of students in the high metacognitive skills category do not show that they possess metacognitive awareness in that category.

DISCUSSION

The research was carried out at the 5th Kertosono Junior High School to raise the awareness and metacognition skills of students with the help of teaching modules and worksheets integrated with the ASICC-based learning model. Lesson Study collaborated with teachers of natural sciences, who acted as facilitators, and researchers, who acted as observers. The teaching module and worksheets used consist of five stages: adapting, searching, interpreting, creating, and communicating. In the adapting phase, teachers provide stimuli that can enhance students' ability to evaluate their own learning goals, images, and videos to stimulate students' knowledge and curiosity. These stimuli enable students to reflect on information that they knew and that they did not know at the beginning of learning. The second stage is searching. Students can search for as much information as possible through the internet or through people who are experts in a particular field according to the subject they are studying. In addition to the interpreting stage, students can take part in activities or conduct workshops designed to encourage group discussion. The final stage in ASICC learning is creating and communicating. At this stage, students are asked to create a product in groups, such as an idea, prototype, or other form of learning product, which is then submitted to another group to get feedback. (Santoso et al., 2021).

Metacognition consciousness research results are based on MAI instrumental responses completed by students in pre-cycle and post-test results following the application of the ASICC-based lesson study learning model to natural science subjects. The data shows that the entire component of metacognitive consciousness is improving with each cycle. Significant improvements are seen in procedural knowledge and debugging strategies, and such improvements mean students can find appropriate and systematic problem solutions The intended solutions include consulting with a teacher or expert when finding a problem, changing the learning approach when it fails, reassessing an existing understanding, and re-reading parts that are not understood (Wiono et al., 2021).

This increase in metacognitive awareness is also evident during the learning process, especially when students answer questions on the worksheets about the respiratory and excretory systems. At the beginning of the learning process, students are already aware of the learning objectives, allowing them to understand what activities need to be undertaken regarding the material. This increase in metacognitive awareness is marked by the ability to solve problems, acquire skills to reflect creatively and independently on what has been learned and improve in remembering and mastering what has been studied (Rasyida, 2022)

This learning model also involves practice so that students understand which strategies should be used to ensure that the practice is successful. Students begin to work together, collaborate, feel brave to ask questions and express opinions during the stages of interpreting, creating, and communicating about what they know as well as what does not align with their thoughts. Another piece of evidence was presented by student A.N., who is usually not active in class, during the observation, who expressed a desire for the next material to be done in groups because the material is easier to understand when discussed collectively. Another student named D is interested in doing the practice and is willing to be appointed by the teacher to demonstrate in front of his classmates. At the practical stage, students can operate the tools and materials used for simple practices with recycled items in groups, illustrate the parts of the practical tools related to human organs and their functions, and create posters about the excretory and respiratory systems. In addition, the interpreting stage worksheet also contains open-ended questions that allow them to use their methods to find new answers (Polin et al., 2022)

After performing a percentage analysis of the gain normalization results, awareness, and metacognition skills of both such data there is a finding that students who have good metacognitive awareness do not always have good meta-cognition abilities as well. This can happen because they possess metacognitive awareness in the form of good planning, but they have not yet been able to apply ideas or concepts from various perspectives in their learning process. Additionally, students have different learning styles; some students easily learn or understand the metacognitive awareness they have, even though they are not yet able to use their metacognitive skills regularly to apply and reflect on their thinking processes, and vice versa. This can also happen due to the differences in the causes of awareness or the level of metacognition that each student possesses (Alkadrie et al., 2015).

CONCLUSION

Classroom action research based on a lesson study applied to eighth-grade students at State Junior High School 5 Kertosono shows that students are starting to actively ask questions, understand readings, and solve problems in groups. Therefore, the ASICC learning model helps students enhance their awareness and metacognitive skills. The improvement is reflected in the student's metacognitive profiles, where in the first cycle, 11.1% of students were in the "medium" category according to the N-Gain test of metacognitive awareness, and this increased to 22.2% in the second cycle. Metacognitive skills showed a significant increase in the "high" category, with 16.7% of students in that category during the first cycle, rising to 33.3% in the subsequent cycle. The findings also indicate that students with good metacognitive awareness do not always possess strong metacognitive skills.

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