



Unnes.J.Biol.Educ. 9 (3) (2020)

Journal of Biology Education

<http://journal.unnes.ac.id/sju/index.php/ujbe>



The Effectiveness of The Group Investigation Model with A *Jelajah Alam Sekitar* Approach to The Metacognitive Skills of High School Students in Animalia Material

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Article Info

Article History:

Received: August 2020

Accepted: September 2020

Published: December 2020

Keywords:

Animalia, Group Investigation, *Jelajah Alam Sekitar*, Metacognitive

Abstract

This study aims to analyze the group investigation model's effectiveness with a *Jelajah Alam Sekitar* (JAS) approach to the metacognitive skills of high school students. This research was conducted at SMA N 1 Bumiayu in the even semester of the 2019/2020 school year. The research design was a Pre-experimental type of One-Group Pre-test-Post-test Design. All students of Class X MIPA SMA N 1 Bumiayu as the population of this research. This research sample was the students of Class X MIPA 1 and 2 taken by a purposive random sampling technique. The results showed that the metacognitive skills of students averaged a score of 75.19, which was in the good criteria. Journal analysis of student learning activities shows that 81.94% has medium criteria. Metacognitive ability test results have an average score of 73.13 in the good criteria. Students' cognitive ability to achieve classical completeness is 79.19%, and the level of students' understanding of the material based on the results of the N-gain test is at the medium criteria. The correlation between metacognitive abilities using a questionnaire with cognitive abilities showed no significant relationship with a large correlation coefficient of 0.018 (very low). On the other side, the correlation of metacognitive skills using tests with cognitive abilities showed a significant relationship with a large correlation coefficient of 0.495 (medium). Students and teachers gave positive responses to the group investigation learning model with a natural exploration approach. The conclusion of this research is the application of a group investigation learning model with a JAS around effectively the metacognitive skills of high school students on Animalia material.

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p-ISSN 2252-6579
e-ISSN 2540-833X

INTRODUCTION

Learning biology for students is not only an effort to gather knowledge about living things. It allows students to discover facts, develop concepts, and discover new values through the process as scientists find experience (Sugiharto, 2011). One of the materials in biology is Animalia. The 2019 National Examination absorptive capacity of the national scope shows the percentage in Animalia material is still meager at 30.16%. The low absorptive capacity is also seen in the range of SMA N 1 Bumiayu. The results of the 2019 National Examination absorptive capacity analysis show a percentage of Animalia material of 25%. This result is the lowest compared to other content. From the results of the absorptive capacity, an interview was conducted with a teacher at SMA N 1 Bumiayu. The results of the interview, the teacher mentioned one of the causes of the low absorption of students is students have difficulty in identifying and grouping living things. When the teacher teaches material classification of living things, students are not given direct experience in the form of observing the original objects in the learning process. Besides, the ability of students to achieve learning outcomes cannot be separated from several factors. One of them is the metacognitive abilities students have. Metacognitive experts conducted research shows that students who have excellent metacognitive skills have better strategies and learning outcomes than students who have low metacognitive skills (Garner & Alexander, 1989; Pressley & Ghatala, 1990 in Schraw & Dennison, 1994). Another study conducted by Soesilawaty et al. (2018) found a positive relationship between metacognitive and cognitive skills learning outcomes.

Efforts that can be made to improve students' metacognitive skills are by applying cooperative learning models of group investigation. The use of group investigation learning models can make students have higher metacognitive skills than students taught with conventional teaching strategies (Listiana et al., 2016). Danial's research results (2010) report that group investigation can improve metacognitive skills and conceptual understanding. In addition, the model can improve students' knowledge, activities, and analytical thinking skills (Kholina et al., 2013; Suryanda et al., 2016). Group investigation puts students into heterogeneous groups to investigate topics and encourage them to actively contribute to learning (Doymus & Simsek, 2009).

The group investigation model's application with a JAS approach or environmental exploration approach directing students to find concepts from phenomena around students. The natural exploration approach around emphasizes the style of delivering the material, which includes the nature, scope, and procedure of explorative activities and provides real experiences to students during learning activities so that the learning outcomes are more meaningful and efficient (Alimah & Marianti, 2017). Learning around the natural environment provides opportunities for students to associate concepts with the real world so that learning will be more meaningful and useful. Besides, the approach of exploring the surrounding nature is expected to improve students' metacognitive abilities.

Metacognitive activities and higher-order thinking skills are underlying potentials that need to be developed in students (Suratno, 2010). The use of metacognitive processes during learning will help students to be able to obtain long-lasting knowledge in memory and improve student understanding (Iskandar, 2014).

Based on the background, it is necessary to research to analyze the group investigation model's effectiveness with a natural roaming approach to students' metacognitive abilities. Therefore, this study raises the title "The Effectiveness of the Group Investigation Model with a Natural Roaming Around approach to the Metacognitive Skills of High School Students in Animalia Material".

RESEARCH METHOD

This research was conducted at SMA N 1 Bumiayu on February 27-March 19, 2020, even semester 2019/2020. The subjects used in this study were students of class X MIPA 1 and X MIPA 2. Sampling was done by purposive random sampling technique. The research data were in the form of student metacognitive questionnaire (MAI) results, journal results of student learning activities, metacognitive skills test results, student cognitive skill test results, and teacher responses and student responses. This research procedure includes three stages: the preparation phase, the research stage, and the final stage of the study. Data collection methods used were tests, questionnaires, and observations. The metacognitive skill questionnaire, journal of

student learning activities, metacognitive skill tests, and student responses were analyzed in a quantitative descriptive manner. The results of cognitive skill were analyzed using classical completeness calculations and N-gain tests. The relationship of students' cognitive skill with the group investigation model with a natural exploration approach and students' metacognitive skills were analyzed using product-moment correlation analysis. The results of the teacher's responses were analyzed by descriptive qualitative.

RESULTS AND DISCUSSIONS

Research Results

This study used a group investigation model with a JAS approach which was applied to two treatment classes. the results of the study consisted of a questionnaire of metacognitive skills, a journal of student learning activities, tests of metacognitive skills, cognitive skills, correlations of metacognitive and cognitive skills, teacher responses, and student responses.

The metacognitive skill questionnaire used was the MAI questionnaire developed by Schraw and Dennison, adapted to high school Biology Animalia material. Data on metacognitive skills by filling out surveys by students can be seen in table 1.

Table 1 The average results of questionnaire metacognitive measurement students

Criteria	Estudents (%)	The average of questionnaire score
Excellent	11,11%	75,19
Good	72,22%	
Began to develop	16,67%	
Very risky	-	
Undeveloped	-	

Table 1 showed the percentage of students in the good and excellent category, which were already ≥75%. Besides, the average score of students' metacognitive skills was 75.19 included in the group of began to develop. This score was from metacognitive knowledge and metacognitive regulation. More about the scores for each element of this metacognitive ability was presented in Table 2.

Table 2 The average results of the student metacognitive measurement questionnaire

The aspect of metacognitive skills	The average of all students
declaratif knowledge	75,07
procedural knowledge	75,93
conditional knowledge	76,92
Metacpgnitive skill	75,97
Planning	73,37
information processing strategy	68,27
monitoring understanding	75,2
improvement strategy	79,02
Evaluation	76,52
Metacognitive regulation	74,41
Metacognitive average	75,19

Table 2 showed that the metacognitive knowledge component's score was higher than the element of the metacognitive skill that was equal to 75.97. The table also revealed aspects of the improvement strategy having the highest score compared to each item of metacognitive skills similar to 79.02.

In addition to the questionnaire results, the results of the student learning journal were obtained as a metacognitive thinking strategy consisting of five aspects that were filled out by students. The results of the journal of student learning activities were presented in Figure 1.1:

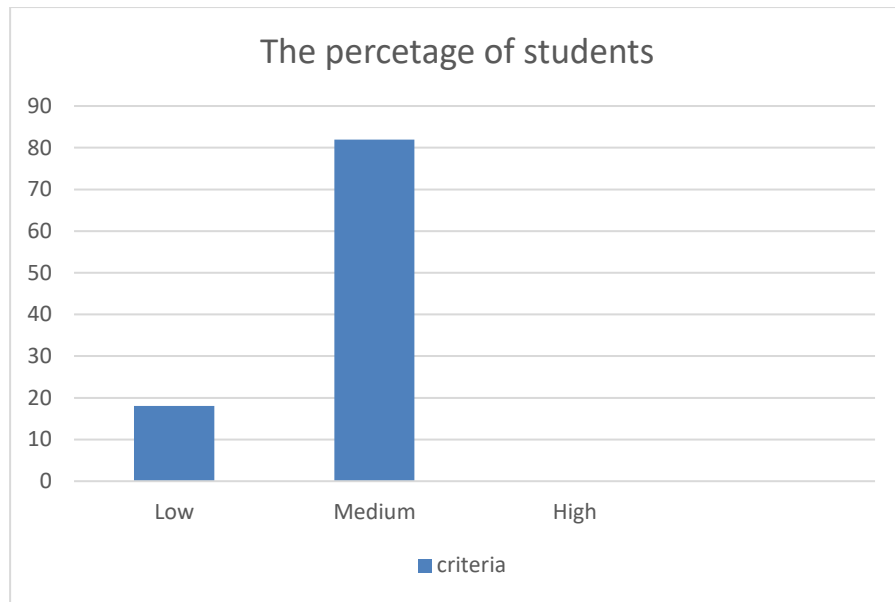


Figure 1 Journal of students learning activity results

Figure 1 above showed the criteria percentage of the low was 18.06%, the medium was 81.94%, and the high was 0.0%. These results indicate that students get an average score on the principles of being range 10-14.

The students' metacognitive were also seen from the students' ability to answer questions. The questions were from the teacher that colored by metacognitive items. Achievement of students' metacognitive skills in learning using the Group Investigation Model with the Natural Roaming Around approach can be seen in Table 3.

Table 3 The interpretation of student metacognitive skill test results

Criteria	ΣStudents%)	The average of metacognitive scores
Excellent	27,78%	
Good	52,78%	73,13
Fair	19,44%	

The metacognitive skills of students in the excellent and good categories have reached $\geq 75\%$. This study also resulted in cognitive skills. The results of students' cognitive skills were obtained from post-test results in both treatment classes. The average data of students' cognitive learning outcomes could be seen in the following table.

Table 4 The average cognitive measurement results of students

Category	pre-test	post-test
The highest grade average	82	98
The lowest grade average	26	60
Overall average	60,17	80,06
The number of students completed	14	57
The number of students incompleted	58	15
MCC		70
Classical Completeness (%)		79,17%

Table 4 showed that students' cognitive learning outcomes vary, and those who score reached 70 were $\geq 75\%$. Also, student learning outcomes have increased after the learning process. The magnitude of the increase in learning outcomes was analyzed using the N-gain test, and the results obtained as in table 5.

Table 5 N-gain test results

Criteria	Σ Students	The average score N-gain
High	15	
Medium	40	0,48
Fair	17	

Table 5 showed that the average N-gain scores obtained by students are in the medium criteria. After obtaining data on metacognitive and cognitive skills resulted in correlation data between students' cognitive skills with the results of the metacognitive skills questionnaire. Moreover, the relationship between students' cognitive test results and metacognitive skills tests were obtained. The results of the analysis were presented in Table 6.

Table 6 The product moment correlation of cognitive with metacognitive skills

	The correlation of product moment	Category
	Cognitive skills	
Metacognitive Skill Questionnaire	0,018	Very low
Metacognitive Questions	0,495	Medium

Overall, the teacher gave a positive response. While students, on average gave an excellent answer to the learning model of the investigation group with a JAS approach.

Discussion

Group investigation is a form of cooperative learning model that emphasizes students' participation and activities to find their material (information) lessons that will be learned through available materials, for example, from textbooks or students can search through the internet. Students identify topics, plan investigations, conduct investigations, obtain conclusions from their investigations which are then presented, and criticize the results of group investigations in the evaluation phase. Learning is then integrated with exploration activities directly in the school environment so students are able to gain hands-on experience observing some of the animals that are around them. Real learning experiences can be useful for solving problems in real life (Machin, 2014). The learning activities provided to the two experimental classes were conducted during three meetings using the syntax of the group investigation model with a JAS approach that would measure the level of students' metacognitive skills.

Metacognitive skills play an essential role for individuals, especially students, to get maximum understanding in getting maximum learning results. The process of thinking in learning is needed as a reflection of knowledge. It is known and as a regulation to control what previously known experience, which is not further known, also thinks of ways to solve the problem at hand.

Based on the MAI questionnaire results, it could be seen that $\geq 75\%$ of students have been categorized as metacognitive skills and have developed very well. In line with the research conducted by Listiana et al. (2016), students taught using a group investigation strategy, which is a form of cooperative learning, have higher metacognitive skills than students taught using conventional teaching strategies. According to Danial

(2010), learners' metacognitive skills are reflected in the work of cooperative work groups in preparing investigative reports, presenting and discussing their findings in class, and the results of tests or final evaluations of mastery of concepts after the learning process. From results, students' average metacognitive skills were 75.19 as a good category. It used the metacognitive awareness questionnaire or metacognitive awareness inventory (MAI). If analyzed for each aspect, it would be known that declarative knowledge was obtained by an average score of 75.07, which means students have been able to manage the information collected. Students already know their weaknesses and strengths in learning biology in Animalia material. Students have understood what teachers expect in the learning process. Procedural knowledge shows an average of 75.93. In this case, students were able to know what strategies can be used when studying Biology. On limited knowledge obtained an average of 76.92, which shows students know when and why to use active learning strategies, and students can motivate themselves to learn. The planning aspect is obtained with an average score of 73.37, which shows students can manage their time well to achieve the goals of learning biology and can solve problems well. Also, students can determine targets to be made at the next meeting, in the aspect of information management strategies obtained an average score of 68.27. It showed students have been able to find and process relevant information about Animalia material by making concept maps. Also, in the aspect of understanding, an average score of 75.2 was obtained, which means students could analyze and solve the problems found when conducting group discussions working on UKBM. In the aspect of improvement earned an average score of 79.02 in this case, students can change their biology learning strategies if they fail to understand biological material. The last aspect was the evaluation obtained an average score of 76.52. It can be said that they have been able to reflect the learning process well using a learning journal. As a result, students could know the weaknesses and strengths of students in learning Animalia material and have an effort to overcome these weaknesses.

Students' metacognitive skills are measured through learning journals for quantitative descriptive analysis. The learning journal as an authentic student assessment is a component of JAS. It is also, as a metacognitive thinking strategy, includes five aspects. The aspects developed students' metacognitive abilities at the metacognitive regulation. They consist of planning, information processing strategies, monitoring understanding, improvement strategies, and evaluations in the learning process. Journal of learning as an authentic assessment of students made individually at the end of learning, obtained the results of the analysis of metacognitive skills that can be categorized into high, medium, and low. The result was that $\geq 75\%$ of students' metacognitive skills get a score in the medium category, and no one got a score in the high class. It has caused the use of learning journals as a metacognitive thinking strategy that has not yielded maximum results. It could be seen by the fact that there are still students who are less severe in writing a learning journal. Several students worked on it together, and the results are identical. It was caused by several factors, one of which is the working time of student learning journals. Work was done at home that made students not dangerous because they think the learning journal has nothing to do with learning. Another impact of work done at home was that students forget about their work writing a learning journal and forget about the learning activities they have gone through at school. Journal work at home by students was due to lack of time control by the teacher so that when done at school will take the next lesson, and if forced even students are not free because of the rush. Another factor that causes this was that students are not accustomed to writing learning journals because they have never written a learning journal after learning activities. Habits in writing learning journals need to be done by students to be able to reflect themselves well. The ability to reflect on oneself causes students to be aware of their knowledge, their ability to understand and control their cognitive processes.

The metacognitive skill was then measured using post-test questions in the form of a description of 4 items. Queries were made concerning metacognitive indicators, namely declarative knowledge, procedural knowledge, and conditional knowledge (Rompayom et al., 2010). The results showed that the average value of the metacognitive skill of students was 73.13 included in both categories. More than 75% of students get good and excellent grades, so applying the group investigation model with a JAS approach was effective against metacognitive skills. Every aspect measured has its criteria. Declarative knowledge was good if students have a clear picture of related questions. Conditional knowledge of students is okay if students have

established the strategies they use. Students explicitly consider the implications between what was given information and questions. Conditional knowledge was useful if students clearly explain when and why to use strategies to solve problems. In general, their approach can concretely link information and questions.

In addition to measuring metacognitive abilities, measuring the cognitive skill of students was also carried out. The cognitive skills resulted show that students who achieve classical completeness in this study amounted to 79.17%. To find out how much the increase in cognitive skill results was performed, an N-gain test, and the results obtained were 0.48 included in the medium category. The application of the group investigation model with a natural exploration approach around makes students discover the concept of Animalia material through the process of directly observing the object being studied so that students are more active in learning and their learning outcomes increase. The results of this study are in line with previous research, which states that the application of a group investigation learning model with a JAS approach optimizing student cognitive learning outcomes (Yuanita et al., 2014). According to the teacher's response, learning by involving students to observe the object directly being studied makes student learning activities better. Students are more enthusiastic and eager to learn by watching what they see so that students feel happy with the learning done. The search for animals in the school environment, which was then documented and presented, made a different learning atmosphere than usual, who only sat in the classroom. The results of student responses showed 83.33% of students stated that the application of the group investigation learning model with a JAS approach made it easier for students to understand Animalia objects that were not direct observations to direct observations. The group investigation model guides students to be independent in finding their knowledge through given problems (Harahap, 2017). In carrying out learning activities with the JAS approach, student activities are needed because one of the characteristics of this approach is constructivism. Students build their knowledge through the direct exploration of learning objects. Direct observation activities can foster scientific thinking skills, instill, and develop scientific attitudes (Anggraeni et al., 2013).

After obtaining data on students' metacognitive and cognitive skills, the correlation test were researched by using the group investigation model and a parametric statistical Product Moment correlation test. In this study, there were two results of the metacognitive skills obtained, namely the questionnaire method and by using the test item description. Each result of metacognitive skill was correlated with cognitive ability results aided by SPSS applications. Based on the calculation, the correlation coefficient obtained between the results of the metacognitive questionnaire with cognitive skills $r = 0.018$ (very low). The results of the correlation analysis between the results of the metacognitive skills of the questionnaire method and the cognitive skills of students showed no significant relationship between the two. Based on research conducted by Aliyah (2018), to bring up metacognitive skills, teachers can create a learning atmosphere with cooperative group learning models, where students were given the task to discuss their knowledge, evaluate individual work and group work and reflect on the learning process they experienced. The use of a group investigation model with a natural exploration approach around makes students more free to learn independently, exchange ideas, and do group assignments by conducting an investigation guided by an Independent Learning Activity Unit (ILAU), this is one of the hallmarks of the JAS approach namely the existence of a learning community. This made students able to solve problems to gain concepts and metacognitive skills of students can be increased. Through journal-making activities which are one form of authentic assessment will encourage students to reflect on themselves. A person's skills in self-reflection can encourage cognitive, metacognitive, learning behavior, and learning outcomes (Herlianti, et al., 2015). This happens because students get the opportunity to reconstruct their knowledge which is a hallmark of the JAS approach namely constructivism. Fauziyah (2013) states that there are factors that cause differences in correlation and relative contributions to a class, for example student motivation, student circumstances, and the environment in which they are learning. Teachers who rarely provide questionnaires in measuring the ability of students can be one of the factors resulting from these correlations. This is the impact of habits that measure students' skills from test scores or cognitive skills only.

In contrast to the metacognitive correlation results using the questionnaire method, the relationship of the metacognitive abilities of the test method using the problem description with the students' cognitive

skills showed positive results. The calculation results obtained a coefficient of $r = 0.495$ (moderate), which shows a significant correlation between students' metacognitive abilities and cognitive abilities. Those results are consistent with the research of Listiani et al. (2014). It also showed a positive relationship between metacognitive skills and academic achievement. The research proved that the higher the metacognitive skills, the better the students' cognitive learning outcomes. The results of other studies conducted by Singh (2012) also confirm that between metacognitive skills of students with cognitive learning outcomes have a significant relationship with learning science.

Some things that need to be considered in applying the group investigation learning model with a natural exploration approach are that the teacher needs to control student learning activities. The high level of student activity causes the teacher to better estimate time when planning to learn. Excellent time management makes students more prepared to do the process of learning activities so that the process of understanding the material for the better. The preparation of a good learning process will lead to a smooth learning process so that metacognitive skills can be adequately measured.

CONCLUSION

Based on the results of data analysis and discussion of the study results, it was concluded that the application of the cooperative group type investigation model with a JAS approach was effective against the metacognitive skills of high school students in Animalia topic.

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