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The Use of Science Reflective Journal Writing by JAS Approach to Train Students' Metacognitive Ability

Esky Purba Septina[1✉], Aditya Marianti[1], Talitha Widiatningrum[2]

Biology Department, FMIPA, Universitas Negeri Semarang, Indonesia

Info articles	Abstract
	This research aims to train students' metacognitive ability used Science Reflective Journal Writing by JAS approach on the material of reproductive system. This type of research was One shot case study which was conducted at SMA Negeri 2 Pemalang. The subjects of this research were students of grade XI MIA 4 and XI MIA 5. The Independent variable of this research was Science reflective journal writing in problem-based learning by JAS approach, while dependent variables were metacognitive ability, activity and students' cognitive learning results. The students' metacognitive ability was measured by using observation sheets of students' activity, discussion assessment sheets, and post-test questions. The results of analysis showed that the use of science reflective journal writing has good influence to train the students' metacognitive ability. The students' metacognitive ability of SMA Negeri 2 Pemalang was included in good category which is 76% , it also gave an influence to cognitive learning result with mastery learn classical $\geq$ 75% and student activity with a range of 62.51% - 81.25% classified as active. Based on the results of the research, it can be concluded that the students' metacognitive ability at SMA Negeri 2 Pemalang for reproductive system material classified as good on the aspects of describing, interpreting, evaluating, planning, and also has good influence to the activity and students' cognitive learning results on the material of reproductive system.

✉ Correspondence:
   Gedung D6 Lt.1 Jl Raya Sekaran Gunungpati Semarang
   E-mail: sqpurba@gmail.com

INTRODUCTION

Learning is a stage to improve the knowledge and add insight to the students as a result of experience and interaction with the environment involving cognitive processes. Not only the process of cognitive, metacognitive skills can also be developed and owned by students. Cognitive and metacognitive are two important components in learning (Corebima, 2009), in particular science lessons.

Learning biology in high school is expected to be a vehicle for students to learn about themelves and the natural surroundings as well as the process of further development in its application in everyday life, but in general learning Biology done in schools is still very theoretical which is dominated by the teachers' activitiy (teacher centered), so the teacher holds a dominant role in the learning activities. Besides learning which is done yet to train the students' metacognitive ability.

Based on the observations towards high school student in SMAN 1 Magelang, SMA Negeri 1 and 2 of Pemalang, some students assumed that Biology is difficult, boring, and a lot of memorizing. The result of introductory questionnaires about Biology learning at SMA Negeri 2 Pemalang showed that more than 50% of students did not like Biology because of the compexity of Biology material and memorizing, also affected by the dislike of the teacher. In addition, the students' metacognitive ability in learning has never been evaluated, teachers are generally limited to provide cognitive aspects only. Whereas the metacognition ability to solve problems is need to be owned and trained by the students in learning activities, especially for high school students (White & Fredericson, 2005). This capability can help students to understand the level of knowledge that has been understood, and students could know the progress of their learning. This can have an impact on the activity and the result of student learning. To handle this necessary approaches and appropriate learning models to the material.

One of the approach that can meet these demands is the Natural Roaming Neighborhood Approach (JAS) and the learning model that can be used is Problem-based learning. PBM is a model of analytical study that uses various existing problems late in daily life, as a context for students to learn the critical thinking and train problem-solving ability (Barrows & Kelson, 2004). Problem-based learning, can also be used as learning models that can improve the students' metacognitive ability (Wicaksono, 2013).

The characteristics of learning activities with the JAS approach is to associate learning with nature around directly, indirectly, or using the media, and there are reports to be communicated either orally, in writing, drawing, photographing or audio-visual (Alimah & Marianti, 2016). If it is associated with JAS component that authentic assessment, metacognitive skills can be trained with the writing of Science Reflective Journal Writing or better known as a reflective journal or learning journal.

Science Reflective Journal Writing can be used as a tool to measure the metacognitive ability in an attempt self-reliance of students in learning (Tavakoli, 2014). It is hoped through the habit of writing down the learning experience, the students are accustomed to express the feeling, thought or their expectation of thw learning given by the teachers, so that students can evaluate their learning, know the progress of learning and result of learning. The aspects that will be observed on a SRJW made by students are aspects of explaining, interpreting, evaluating, and making future plans (RMIT, 2006).

The teachers could read the SRJW as inputs to see the students' ability in the material being studied (Kurniawan, 2014). Moreover, the culture of writing is also still low in Indonesia so that it is appropriate to be used as an instrument to train students' metacognitive ability (PISA 2012).

The material that will be tested in this research is the material of reproductive system for grade XI High School. On the reproductive system material there are concepts that have to be learned and understood by high school students completely and detail, and contains of a problem closely related to events that occurred in a students' environment such as the process of menstruation, wine pregnancy and identical twins. To be able to learn and solve problems found in the reproductive system material,

students must have the critical thinking ability to make it easier in understanding and finding the concept of the reproductive system. This research aims to train the students' metacognitive ability by using a science reflective journal writing in problem-based learning by JAS approach on the material of reproductive system as well as knowing the activity and the result of the students'cognitive learning.

RESEARCH METHOD

The research method used was one shot case study. The population of this research was the grade XI SMA Negeri 2 Pemalang school year 2016/2017 with samples of Grade XI MIA 4 and XI MIA 5. The samples were taken purposively sampling.

The independent variables used in this study was the science reflective journal writing in a problem-based learning (PBM) by using JAS approach, while the dependent variable was metacognitive ability, activity and the result of cognitive learning. The main instrument used to train metacognitive skills was SRJW instruments adapted from RMIT University, questionnaires awareness of metacognitive as supporting SRJW instrument adapted from Schraw & Dennison has been modified and validated by expert metacognitive lecturers, instrument of multiple-choice test contains of 30 questions and students discussion sheets (LDS).

Supporting instruments were form of student activity observation sheets, questionnaire study of biology, and the questionnaires form.

The techniques of data analysis used were the analysis of early data in the analysis form of multiple-choice questions used ANATES V4, and further analysis was the form of student assessment metacognitive ability, result of stuents' cognitive learning, also the student activity used Microsoft Excel 2010.

RESULTS AND DISCUSSION

The results of the research showed that the use of science reflective journal writing has a positive influence to train students' metacognitive ability in problem-based learning by JAS approach on the aspects of describing, interpreting, evaluating and planning. Metacognitive ability is a person's consciousness about how he learns, the ability to assess the difficulty of a problem, observe the level of self-understanding, the ability to use the varieties of information to achieve the objectives, and the ability to assess their own learning progress (Jonassen 2000). Metacognitive emphasis on studying something that has been studied. In this case, the students are trained to be able in describing, monitoring, planning and evaluating the learning process consciously. Metacognitive awareness on students to make students more enthusiastic in participating the learning process, in addition, students who have metacognitive ability will be able to understand the lessons material well and are able to solve problems encountered in order to obtain a good cognitive learning result. This research used SRJW to train students' metacognitive ability used one model of problem-based learning by JAS approach to help students in solving problems in the reproductive system materials.

Science Reflective Journal Writing (SRJW) is written by the students in every last meeting, used to train metacognitive ability. Metacognitive ability includes four aspects of describing, interpreting, evaluating and planning. Through SRJW, teachers can know the progress of student learning, and students can find out what is already known and they do not know. Each student in the material of reproductive system collected five learning journal which was corrected and made scoring so we got an average score with a maximum score of 16. The score details of learning journals can be seen in Table 1.

Table 1 Score of Science Reflective Journal Writing (SRJW)

Aspect	Grade	
	XI MIA 4	XIMIA 5
Describe	3	3
Interpret	3	3
Evaluate	3	3
Plan	2	2
Average Score	**11**	**11**

The results of SRJW showed that most of the students in grade XI MIA 4 and XI MIA 5 were capable in reflecting of learning activities well covers four aspects in SRJW. SRJW average score was 11 with a percentage of 76%. This figure already exceeded the minimum average requirement of 60%, although in previous learning has never done learning by using SRJW, new students are trained to write a journal in the previous chapter named immunity system. This means that SRJW can be used to train students' metacognitive ability in problem-based learning by JAS approach. After all of the student's journal has read, SRJW which made by students already qualified in accordance with guidelines that included aspects of describing, interpreting, evaluating and planning. It showed that students have started to have trained metacognitive awareness because students are able to identify strengths and weaknesses in their learning process and had an attempt to overcome these shortcomings.

The students' ability to reflect learning activities has become one of the benefits seen when doing research among the students can master the material being taught with a better understanding of the concept. This showed that the use of SRJW in biology learning of reproductive system material has positive influence to train students' metacognitive ability. Learning by using SRJW need to be trained continuously so that students' metacognitive ability can develop well. Metacognitive development needs to be sharpened by education, even since a person is in the elementary school level (Kamid, 2013). This is supported by Anggraeni's research (2009) which states that the implementation of learning journals has significant impact on students' metacognitive ability and Rachel Ong (2004) also states that the writing of learning journal is helping students to practice their metacognitive abilities.

In addition, in using SRJW was to train students' metacognitive ability, this research also used supporting SRJW instrument namely questionnaire of metacognitive awareness or metacognitive awareness inventory (MAI) according to Schraw & Dennison (1994) that has been validated in terms of content, language and writing by the experts of metacognitive. This instrument consists of 52 statement point with two optional answers, they are "True" scores 1 and "False" score 0. From MAI questionnaire analysis showed that the average score of students classified as good metacognitive ability in every aspect and has been gotten good results with the metacognitive ability average score of 40. This score is quite good from the maximum score of 52.

If analyzed every aspect of MAI questionnaire can be seen that declarative knowledge obtained an average score of 6.5. This shows that students are already good in organizing information obtained, students can already find out disadvantages and advantages of itself in learning biology of reproductive system material, and students already understand what is expected by the teachers in the process of learning. On procedural knowledge obtained an average score of 3. This shows that students can already figure out what strategy can be used when learning biology. On conditional knowledge obtained an average score of 3.5. This shows that students already can find out when and why to use an effective learning strategies and students can motivate themselves to learn. On the planning aspects obtained an average score of 4.5. This shows that high school students grade experiment 1 and 2 can manage the time properly to achieve the objectives of learning biology and can solve the problem well. Whereas, in the aspects of information management strategy obtained an average score of 7.5.

It showed that the students already can find and process important information about the reproductive system by creating images, diagrams or concept map. Next, on the aspect of understanding obtained an average score of 5.5. This shows that students are able to analyse some

optional answers before solving the problem that was discovered on biology learning process. On the aspects of improvements obtained an average score of 5. This shows that students can already change the strategy of learning biology if it fails to understand the biology material. Last, on this aspect of the evaluation obtained an average score of 4.5. This shows that students can already reflect the learning process very well, knowing how well the students ' ability in completing task given by the teachers and summarize the material as an effort to make learning biology easily in particular material of reproductive system. From the results of discussion on the MAI questionnaire can be seen that the students' metacognitive ability can be trained well by using SRJW at all aspects of describing, interpreting, evaluating, and planning.

Apart from the benefits already explained, the use of SRJW in problem-based learning by JAS approach can not be concluded as optimal because there are still journals that have not been qualified in accordance with the guidelines that have been given previously. About 15% of students just cheat their friends without knowing the meaning of the journal contents and do not cover the important points that should be written in SRJW. For example, students did not write any difficulties or problems were found during the learning and solutions that should be made to overcome difficulties in learning, did not write down the advantages and disadvantages when studying, did not write the material that already understood and not understood yet. To further enhance the students' metacognitive ability, metacognitive ability need to be improved regularly with SRJW on the next learning, both in the subjects of biology as well as other subjects.

During the learning process using the Science of reflective journal writing in problem-based learning model by using JAS approach desperately needed the students' seriousness and they are fully involved on learning process with resource persons from the local health center to help students explore the related material of reproductive system and students could ask questions directly to the doctor and midwife of reproductive health problem. JAS approach emphasizes the importance of direct interaction between students with biological objects so that they can explore and discover the concepts. JAS approach itself has characteristics (Mulyani et al, 2008) exploration, constructivist, the process of science, learning community, bioedutainment, authentic assessment.

In this research, six components of JAS approach integrated with problem-based learning model. This learning design also involved environment as resource of students' learning to find out various kinds of information. So in this learning, students were not only as recipients of information but also directly involved to explore the knowledge of the reproductive system. The exploration is done by resource persons from the local health center. Students could ask questions about reproductive health and reproductive diseases to the doctor or midwife. In this learning the students also built their own knowledge (constructivism) through the problem-solving activities in student discussion sheets (LDS). LDS that serves a variety of related problems of the reproductive system includes identical twins, fraternal twins, infertility, wine pregnancy by exploring his knowledge through discussion (learning community). Furthermore, this learning also involved the bioedutainment component that made the classroom atmosphere fun by presenting educational games that associate the students' learning experience as outlined in questions about reproductive system then will be answered by students, then at the end of each meeting, students wrote SRJW as authentic assessment for self-evaluation during the biology learning.

For the data of students' cognitive learning results derived from LDS score in the material of reproductive system through classroom discussion observation and post-test score. Based on the analysis of learning results by using Microsoft Excel obtained the number of students complete the study, the number of students who did not complete the study, the percentage of classical learning completeness or percentage of students who reached minimum score in one grade are presented in Table 2.

Table 2 Data of Students' Cognitive Learning Result

Criteria	Grade	
	XI MIA 4	XI MIA 5
Total students	40	40
Average score	81,8	84,8
Hghest score	92,5	95,9
Lowest score	71,1	77,1
Students reached minimum score	34	40
Students did not reached minimum score	6	0
Classical learning completeness	85 %	100 %

The analysis result of the LDS calculation values and the post-test showed that the use of SRJW in the problem-based learning (PBM) by using JAS approach has positive effect to the students' cognitive learning results. The average score obtained in grade XI MIA of 81.8 and Grade XI MIA 5 of 84.8. These score already reached the assessment criteria very well with overall average cognitive learning results of 83.8. Furthermore the percentage of student learning completeness, the students of SMA Negeri 2 Pemalang has proved beyond the minimum criteria (75%). From table 2 also showed that the number of classical learning completeness is very high, 85% in grade XI MIA 4 and 100% in grade XI MIA 5. This indicated the influence of using SRJW as a reflection process to train the students' metacognitive ability.

So SRJW made by students also has function as a tool to facilitate the identification process of students learning difficulties in understanding the concepts that have not yet understood by students. Students who can know its learning difficulties early can be more quickly make the effort to handle learning result difficulties, so that at the time of the discussion and the post-test, the whole concept has been understood by the students.

Good metacognitive ability causes cognitive learning result better. This statement is also supported by Sabilu (2008) which stated that with the process of reflection could improve the concepts mastery so that the students' metacognitive and cognitive abilities increased. Proven from the score obtained by the students at SMA Negeri 2 Pemalang with E-47 and E-63 code. Students who got code E-47 obtained a metacognitive score of 13 with a relatively good score of 81.25 and also got good cognitive score of 91.9. Likewise with the student E-56 code got good metacognitive and cognitive score that both are respectively 87.5 and 82.9. From these results showed that metacognitive have a positive relationship with the students' learning and understanding. Therefore students who are aware of their metacognitive abilities will be able to improve learning and academic ability (Perfect & Schwartz, 2004).

Several previous research results prove that between the students' metacognitive abilities and cognitive learning result have a significant relationship, one of study conducted by Singh (2012) showed that there is a linear relationship between metacognitive ability and students' cognitive learning result in science lessons. Students who have good metacognitive ability will show good learning performance compared with that of students who have low metacognitive ability (Coutinho, 2003). This showed that the metacognitive ability became one supporting factor of student success in improving students' cognitive learning result.

From the total students at SMA Negeri 2 Pemalang, there are students who have not completed. Several factors can affect student learning result include factors in the family environment, school environment, and playing environment (Ernida, 2015), as well as the factor of learning approaches that include strategies, models and learning methods that make students less enthusiastic to follow the study. If it is associated with the data analysis results of metacognitive ability, students who have low score of metacognitive ability obtained low cognitive learning result also. It can be seen from the student's code E-8, E-10, E-19, E-20, E-28 and E-32 got the final score of cognitive learning of <75 so that the student were not completely in the material of reproductive system and their score of the metacognitive ability of <60.

There are some things that cause low metacognitive abilities and students' cognitive learning result are low motivation and students' concentration during the study, low levels of students' awareness (response) to the stimulations provided by the teacher, as well as learning strategies used were also one factor causing low the students' metacognitive abilities. Lack of appropriate learning strategies can make students less enthusiastic in grade. It is also supported by the results of research conducted Karmana (2010) which showed that learning strategies have an influence to the students' cognitive learning and metacognitive abiliy. Some students claimed that they did not like learning in a group because it makes the classroom atmosphere noisy and less focus during the learning. Nevertheless the results of classical learning in grade XI and 4th XI MIA MIA 5 is already classified as high because it already exceeded the completeness indicator of ≥ 75%.

During the learning process by using the Science Reflective Journal Writing in problem-based learning by using JAS, students seemed enthusiastic in participating the study. Active students asked the teacher if there were problems or things that were not understood. Students were also actively discussing with a group of colleagues, exchanging ideas to solve the problems of reproductive system in the LDS. After the discussion, students are required to present the results of the discussion. Through the presentations, students became more easily understand the problems presented. It is proved that the use of SRJW in problem-based learning by using JAS approach has positive effect to the activity and students' cognitive learning result.

In problem-based learning by JAS approach using Science Reflective Journal Writing also affect to the students' activities in the reproductive system material at grade XI MIA. The students' activities of grade XI MIA in SMA Negeri 2 Pemalang are presented in figures 1 and 2.
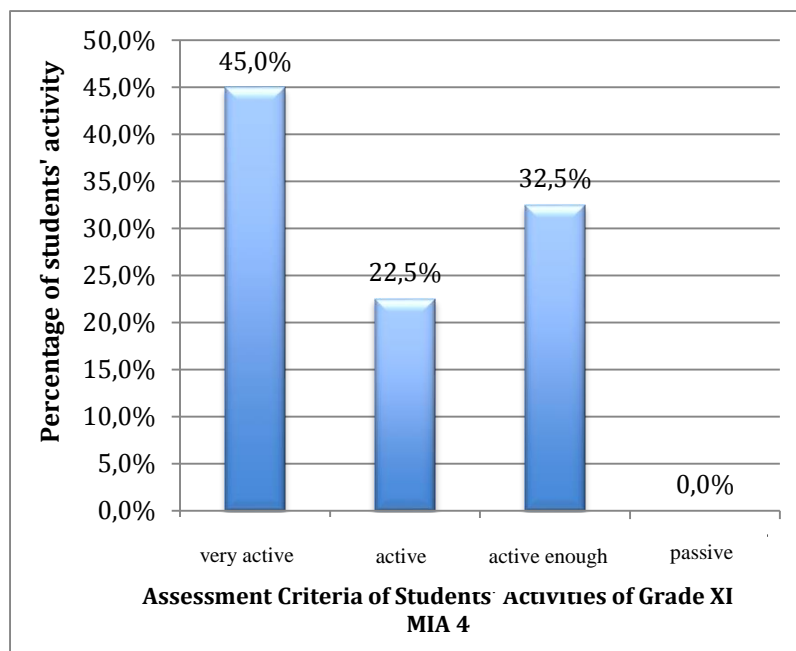
Figure 1 Students' activity of grade XI MIA 4.
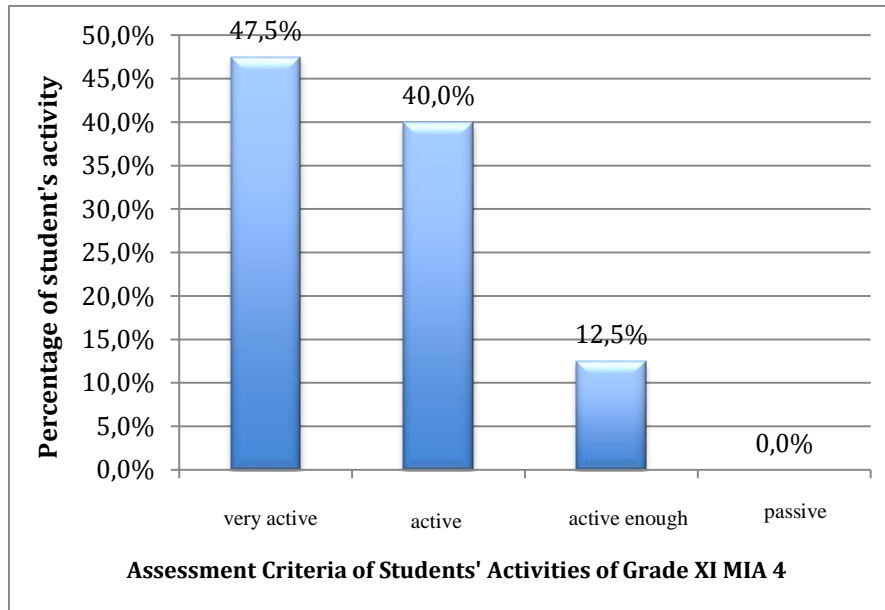
Figure 2 Students' activity of grade XI MIA 5.

Based on Figure 1 and 2 can be seen that the average percentage of students' activity in grade XI MIA 4 and grade XI MIA 5 in SMA Negeri 2 Pemalang classified as active that is in the range of 63-81%. This result can be proved from the assessment sheet activity. The students classified as active in asking questions during the learning. Students were active in giving opinion, noted the summary of learning materials and answered questions from the teacher. Students classified as very active in presenting their discussions result and pay attention to the teachers' explanation and there were nothing passive students. Students activity is demonstrated when ask and answer questions' activity in classroom, while playing games, when discussing and doing the LDS. Students who are more active in asking and responding questions also got good score of metacognitive ability. This can be seen in students with the code of E-3, E-11 and E-12 gained metacognitive ability good score of > 60 and the students' activity classified as active and very active. This is according to Hamalik's research (2011) which stated that modern education focuses on the activities of the students, so that students can have the knowledge, understanding, experience, skills and other behaviors.

The supporting data analysis of students' questionnaire responses towards learning using Science Reflective Journal Writing showed quite good results with the percentage range about 63% - 100%. In line with this, the results of interviews with teachers of Biology also showed that this study can be used as a media to train the students' metacognitive ability and can be used as a reference for teaching biology in other materials.

The research results have been presented in accordance with the research of Henter & Indreica (2011) states that Science Reflective Journal Writing can be used as a media to measure the metacognitive ability. In addition, the student learning results can be well developed through Problem-Based Learning (Fitriyani dkk, 2015), and problem-based learning can improve the students' metacognitive ability especially in the field of Biology in the material of reproductive system (Azhari, 2012).

CONCLUSION

Based on the research results and discussions, it can be concluded that the use of Science Reflective Journal Writing in problem-based learning by JAS approach in the material of reproductive system have positive influence to the students' metacognitive ability in the aspect of describing,

interpreting, evaluating and planning. The students' metacognitive ability in SMA Negeri 2 Pemalang is quiet good with the average of 76%. This figure includes in the range of 61-80, in addition, it also affects to the activity and cognitive learning results with classical learning completeness of $\geq$ 75%.

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