THE ARGUMENTATION CAPACITY IMPROVEMENT THROUGH THE PROBLEM BASED LEARNING IMPLEMENTATION IN CLASS X MIA 1 SMA BATIK 2 SURAKARTA

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ABSTRACT

This research aims to improve the students' argumentation skills in X MIA 1 SMA Batik 2 Surakarta Academic Year 2014/2015 through the problem based learning implementation. This research uses a classroom action research which consists of three cycles. Each cycle contains of planning, acting, observing and reflecting. The subjects of this research are the students in X MIA 1 SMA Batik 2 Surakarta Academic Year 2014/2015 amounts to 33 students. The data are collected from test, interview, and documentation. The data validation uses triangulation technic. The data using descriptive analysis was based on three components, they are: data reduction, data presentation and drawing the conclusion or verification. The research procedure is using spiral method. The results show that the students' argumentation skills are increase from pre cycle, cycle I, cycle II, and cycle III. The average of the students' argumentation skills are increase from 28,96% to 50,06%. Claim aspect increase from 61,62% to 82,49%; evidence aspect increase from 15,66% to 37,37%; and reasoning aspect increase from 9,60% to 30,30%. Based on the research result, the conclusion are the argumentation skills improvement through problem based learning implementation in X MIA 1 SMA Batik 2 Surakarta.

INTRODUCTION

A good learning process is a learning which is able to develop the skills needed in the 21st century such as the ability to think critically, solve problems, collaborate, and communicate (Kulsum & Nugroho, 2014). This capability can be accommodated through the well prepared learning process. According to Harris et al. (2012), the main part in the learning process is learning involved in many important aspects include formulating questions, describe the mechanism, and build arguments.

The fact found in the early observations in the class X MIA 1 SMA Batik 2 Surakarta shows that during the learning process only a few students are asking opinions related to the materials. When the teacher asks, the students answer is still in a simple statement without any support of evidence and reason. The discussion and interaction activities between the students and teachers are less intensive. The results are indicating that the student has not been trained to argue. Follow-up to the results of the early observations done by giving a test description that includes the indicators of the argumentation ability according to Mc.Neill & Krajcik (2006).

The test results obtain the *claim* aspects in the percentage of 61.62%; *evidence* 15.66%; *reasoning* 9.60%. On average the students' argumentation ability is 28.96%. Based on the results obtained, that the ability of the student's argument is still low. This is because a good argument should contain aspects of argument including a *claim*, *evidence*, and *reasoning*. The test results show the students' answer is a statement without evidence and rationale supporting.

Arguments train the students in the use of

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thinking abilities. According to Song & Deane (2014), argument plays an important role in developing the critical thinking and add depth understanding of ideas. The argumentation ability is important to develope in the biology learning because it can improve the idea to test the students' understanding.

The ability of argumentation according to Mc.Neill & Krajcik (2006) contains of three aspects of covering *claims*, *evidence* and *reasoning*. *Claims* are statements that address. *Evidence* is scientific data to support a statement. *Reasoning* is an excuse or justification for linking a statement with evidence.

The cause of the students' low argumentation ability are lacking of the teachers' effort to maximize the students to give argument. The aspects in the argumentation can be developed through the proper learning process. One of the efforts to improve the ability of argumentation in the class X MIA 1 SMA Batik 2 Surakarta is to implement learning model problem based learning.

The application of problem-based learning model is prioritizing the issues to stimulate and focus the learning activities of the students (Chin & Chia, 2005). Problem-based learning by Tan (2003) consists of five steps, namely activities meeting the problem, problem analysis and learning issues, discovery and reporting, presentation and reflection solution and integration, overview and evaluation. Each step in the problem-based learning models are able to accommodate the students' ability argumentation. *Claim* which a statement is appearing on the phase of meeting the problem and problem analysis and learning issues. In the phase of meeting the problem, *claim* appears to start the learning process. According to Tan (2003), in this phase, statement of problems are arising from each student. In the phase of problem analysis and learning issues, the students make a list in the form of a statement about the identification of problems, the problems formulations and problems analysis.

Evidence is a scientific data to support a statement (Wilson et al., 2010). The use of data as an evidence in problem based learning, thrive on discovery and reporting phases. In this phase, students discuss relevant issues list and look for evidence to support the initial statement related to the problems. All information collected and selected to be used as supporting evidence through discussions.

Reasoning as a justification related to the statements and evidence used in the developing solution phase presentation and reflection. The

students in the group report the results of the discussion and present solutions. During the presentation, the students explain their solutions to problems related to the results of the discussion. According to Saracaloglu et al. (2011), the ability to explain and justify based on a statement supported by the data is part of the ability to create an argument.

The last phase in the problem based learning is *integration*, *overview* and *evaluation*. Integration is combining the knowledge before and after the settlement of the issue. Overview is drawing conclusions about the form of learning objectives have been achieved. Evaluation is to evaluate the learning that has been done. In this phase the claim arises in the form of a statement in the form of conclusion or decision. The conclusion is supported by the strong evidence. Reasoning also appeared in the form of analysis which gives evidence related to the conclusions or decisions made. According to Foong & Daniel (2010), a decision that is in the form of a statement supported by evidence and the results of the analysis is the basis for an argument.

The argumentation ability is crucial to develope in the learning process. Facts found in the class suggests that the students' argumentation ability is still low. The low ability of argumentation can be upgraded through the application of learning model that is able to accommodate the ability of the argumentation. Therefore, research that aims to improve the ability of argumentation through the application of models of problem based learning in class X MIA 1 SMA Batik 2 Surakarta academic year 2014/2015.

METHOD

Research carried out is an action research. The experiment was conducted in the class X MIA 1 SMA Batik 2 Surakarta in the semester Academic Year 2014/2015. The subjects numbered 33 students. The instructional material is the environmental change / climate and waste recycling. The models adopted is a model problem based learning. The research was divided into three stages: preparation, research, and completion. The study is in three cycles from 4 to May 23, 2015. The collection of the data is obtained using a test, interview, and documentation. The research success indicators is an increase of 20% from the based line. The validity test is done using triangulation techniques. The data analysis is using qualitative descriptive through three components, including data reduction, data presenta-

tion, and conclusion or verification. The research instrument has been validated by a Biology lecturer of Universitas Sebelas Maret.

RESULTS AND DISCUSSION

The research results showed an increase in the ability of each aspect of the argument in each cycle. The achievements average are shown in the Figure 1.

The achievements in the cycle I show improvement in every aspect of the ability of argumentation. The test results show that the achievement aspect of *claim* is 66.67%; Evidence aspects of 27.61; and reasoning aspects of 21.55%. The acquisition of the achievements on the cycle II show an increase rather than in the cycle I. The results show the *claim* aspect of 72.39%; Evidence aspects of 30.98%; reasoning aspects of 28.96%.

The achievement of the cycle III based on test results obtained the *claim* aspect by 82.49%; Evidence aspects of 37.37%; reasoning aspects of 30.30%.

The average of the argument achievement on each student varies from Pre Cycle to Cycle III. The results are shown in the Figure 2 students.

The students' acquisition score of each Pre Cycle to Cycle III are varies. Most of the students are continuing to increase the arguments ability on each cycle. The 28 students show an increased achievement in Cycle III compared to their score in the Pre Cycle. But there are also some students who impaired the argumentation ability. There are 5 students who the achievement are decreased at the end of Cycle III.

The achievements obtained by the test results show an increase of the pre-cycle, the cycle I, the cycle II, and meet the target of the research
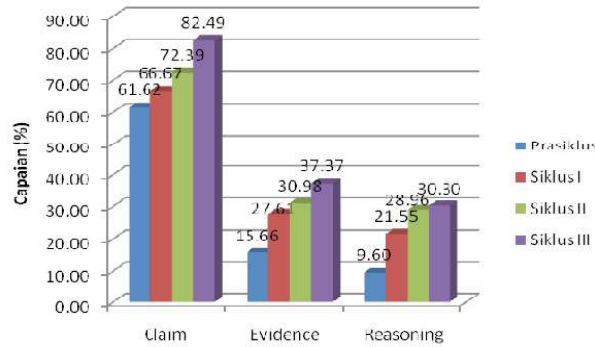

Figure 1. The Histogram of Argumentation Achievement Precentage in Every Aspect
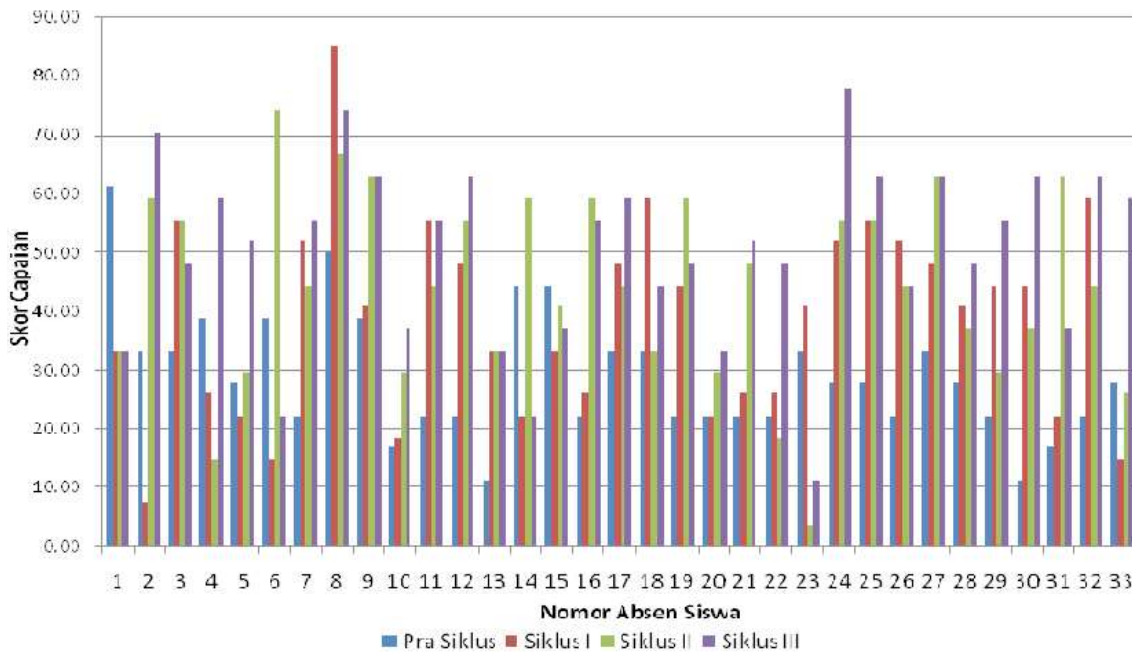

Figure 2. The Histogram Achievement of the Students' Argument Capability Average in Pre Cycle up to Cycle III

is increased by 20% from the initial achievements in the cycle III. The increased is influenced by the application of the problem based learning model. Each stage in the problem based learning model support the improvement of the student argumentation abilities.

During the learning process of the students, they have a group discussions to exchange ideas and opinions related to the discovery that each student earn. Through the discussion, the students develop the argument ability. This is according to Schmidt et al. (2011) which states that the group can turn the discussion to exchange ideas resulting collaboration to solve problems.

The class condition with the application of problem-based learning supports the students to argue. The results during the research supported by Mulya et al. (2013) shows that the research in class X using the application of problem based learning has a positive impact on the learning process in the classroom, especially in creating a conducive atmosphere for the students to argue. The interaction within the group push the students to submit opinions more freely without fear. During the group discussions many students asking his opinion. Kaya et al. (2012) also stated that the arguments on high school students greater arise when discussion.

The activities of concluding the learning process is functioning more in the Cycle III. While Foong & Daniel (2010) states that the conclusions in the form of a statement supported by evidence and the results of the analysis is the basis for argumentation.

The learning process implementation shows some improvements in each cycle. The ongoing improvements affect the ability of the student's argument. This is evidenced by the improvements of students' argumentation test results in each cycle. A test of the argumentation ability about the description form given at the end of each cycle. The test results show an improvement until it reaches the research target in the cycle III.

The application of the problem based learning model allows the students to explore and understand each material being taught. Erdogan and Senemoglu (2014) states that the application of the problem-based learning model creates a learning environment that is meaningful and makes the students actively and independently to find answers of the problems that have been formulated by the students themselves. The interview result shows that by opening the learning process with the evironment problem which are exist sourrounding the students, they become easier to understand the learning material and are

more motivated to seek their own answers to the problems that exist either through group discussion and review of the literature.

Students are actively seeking out the learning materials concept by discussing and asking friends or a teacher compared to learning by lecture method as in the Pre Cycle learning proccess. Working in groups help the students to learn concepts better because there is exchange of ideas between members of the group, and help the students to recall the concepts learned.

The action research classroom implementation which is conduct in three cycles resulted in the improvements to every aspect of the argumentation ability. Based on the achievements, the aspect of the *claim* is always occupy the highest gains, then aspects of the *evidence*, and the lowest aspects of *reasoning*.

Based on the test results, the total of improvements of pre cycle *claim* until the cycle III is 20.87%. Research data show that the students' achievement in the pre cycle aspects *claim* until the cycle III is the highest compared to the achievement aspects of the evidence and reasoning. The results were supported by the results of the research Cho and Jonassen (2002) which states that students are more focused in making a *claim* (statement) because it is a basic part of the solution to a problem.

The *evidence* aspect has increased greater than the aspects of the *claim* and *reasoning*. The total increase are amounted to 21.71%. The great improvement obtained is affected by the implementation of the better learning process. It is also influenced by the environmental pollution material supported by the application of problem-based learning, especially at the discovery stage and reporting where the students in groups are discussing the data which supports the learning related to making it easier for them to understand the material. Group discussions familiarize the students in brainstorming so it makes them to receive the learning material. According to Mc.Neill (2011), to develop an understanding and ability to use evidence is an important component in giving argument and train them to use the whole field of the students' knowledge.

The evidence aspects has increased the most, but based on the analysis of the students' argument test results that most students have not been able to provide evidence in accordance with the statements made. Seen that students are having difficulties in providing evidence to support the claim. These results are supported by Mc.Neill & Krajcik (2006) which state that students have difficulty in determining the data that

is considered as an evidence and are not able to use the evidence appropriately. Students ultimately use the data that can not support or are not relevant to the statements made.

The reasoning aspect achievement is also increase from pre cycle until the cycle III. The total improvement in the reasoning amounted to 20.70%. The reasoning achievements and improvement aspects is the lowest compared to the claim and evidence. This is supported by the students' results of interviews which show that the most students encounter difficulties when making an excuse or explanation in linking the statement with the evidence. The test results that many of the students' answers are not able to connect the statement to the evidence. Most of the students are not able to give an exact reason. These results are supported by Mc.Neill & Krajcik (2006) which states that the most difficult task for students in an argumentation component is reasoning. Most of the students' arguments are in the form of a statement which with a little supporting reasons. The test results that the reasoning achievement aspect has increase but the results are continuously is in the lower quality than claim and evidence.

Based on the results on the argument aspects, the research targets have been achieved in the cycle III. Every argumentation aspects capabilities have increased, but it still categorized as low. This is due to the high acquisition of claim aspects and the students have not been accompanied by high acquisition of evidence and reasoning aspects. Evident from the acquisition of the evidence and reasoning aspects are still below the overall argumentation average viability.

There are also some students who experience a decrease in the arguentation ability acquisition score. Several factors influence the decrease in the students' acquisition, including the students who are in the less good condition during the learning process. The biology class which conducted in the last hour causes some students has already tired and fatigue that result not maximum in following the teaching of these students. In addition, it also influenced by the learning topics varying in each cycle. This is supported by the research conducted by Mc.Neill (2011) which indicates that the quality of the students' arguments do not have a consistent pattern of improvement but more volatile based on the learning materials and tasks assigned to be assessed. Each topic has a learning difficulty levels respectively.

CONCLUSION

Based on the results of this study, we can conclud that there is an improvement of the scientific arguments capabilities through the implementation of a model problem based learning in class X MIA 1 SMA Batik 2 Surakarta academic year 2014/2015.

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