Empowering Biology Students Creative Thinking Skills in Biology Learning of 21st Century: Guided Inquiry-Based Lesson Study

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Abstract: Observation result on Thursday 7th September 2017 shows that students in biology learning of 21st century tend to be quiet and not focus on learning during the discussion process, while students who are active only some students and tend to remain. Based on these facts, we need a strategy that help students more creative in their learning in the classroom, one of them is guided inquiry. The aim of this study is to describe the implementation of guided inquiry-based lesson study to improve the creative thinking skills of biology students who take Biology learning of 21st century course. The type of this research is Classroom Action Research. The subject of this study is all of biology education students in VII semester who took Biology learning of 21st century course. The result of this research are (1) Guided Inquiry-Based Lesson Study can improve students' creative thinking skills, which can be known from observation result of students creative thinking skills in cycle I is 70,8% increase to 73,2% in cycle II.

1 INTRODUCTION

The general skills of master program is to increase the capacity of learning independently (Kemendikbud, 2014). Training the students to be a self-supporting and lifelong learners for master students could be conducted through Field Experience Practice (Susilo, 2015). This activity was conducted in a group of 3 or 4 people who then formed Lesson Study (LS) Team. LS team learn to teach students of biology education FMIPA UM in different courses, depending on the interest and choice of students. Practice activity facilitate master students to learn, and apply directly the knowledge and skills acquired during classroom activities.

The Aims of Field Experience Practice (FEC) that was conducted by the author on Biology learning of 21st century were to teach 21st century life skills, to develop 21st century life skills, form a profesional learning society, and produce article. Master students guide the students of Biology learning of 21st century to teach and trained 21st century life skills of their friends through Lesson study to achieve this goals. The role of Master students in this activity is as a clinical supervisor. Master students provide a guidance for students who are in charge to teach their friends to develop chapter design, lesson design, student worksheets, determine the instrument to measure students skills that they want to develop.

Biology learning of 21st century course is a course that teach students about many kinds of 21st century life skills. This requires students to be able to master and develop the necessary 21st century skills. Master students are given the task of helping undergraduate students develop their life skills, so that undergraduate students are asked to directly practice designing how to develop life skills of the 21st century, then implementing it and finally measuring the achievement of the design that has been implemented. During the mentoring process of undergraduate students, FEC students also carry out LS in guiding students to implement LS in order to develop 21st century skills.

Observations have been conducted in Biology learning of 21st century course two times, ie on August 24 and September 7, 2017. The results of the observations indicated that the class was dominated by only a few students. Students who asked questions only five students and students who answered were also only those students. If these five students were distributed in different groups then this active student

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will dominate in the group, thus preventing other students from contributing their creative ideas. This fact indicates that a learning model is needed, because it can help students more actively study in the classroom, so that each student can convey his idea freely. There are a variety of learning models that can be applied to overcome this problem. The learning model chosen by the writer was guided inquiry model based on lesson study with scaffolding method.

Guided inquiry model is a learning model that helps students to find answers of questions or problems they encounter through investigation. This model is very suitable to help students to be active in learning because each student in each group is asked to look for a problem and then seek answers from these problems. Implementation of this model is expected to improve students' creative thinking skills in seeking answers and solutions from problems in the field of learning they encounter in the classroom. Learning models that require students to conduct an inquiry can guide students to increase the curiosity that can be seen from the investigation of the problems undertaken during the learning processes, the smoothness in finding solutions, flexible thinking that will help students look for many different alternative solutions, and authenticity of ideas.

Implementation of inquiry learning model was conducted through lesson study, it aims to facilitate master students and undergraduate students who are guided in investigating the problems that occur in the learning process. Lewis (Ibrohim and Syamsuri, 2008) explained that the Lesson Study was chosen to be an alternative that positively impacted the prospective teachers and students who were taught. Furthermore, it is explained that the Lesson Study is an alternative way that can improve the quality of learning and student activities, because a) the development of Lesson Study is done and based on the result of "sharing" of professional knowledge based on the practice and the teaching result which is done to the teacher; b) a fundamental emphasis on Lesson Study, ie the quality of student learning; c) the purpose of the lesson to be the focus and the main point of attention in classroom learning; and e) Lesson Study will place the main role of teacher as a researcher.

The Implementation of guided inquiry-based lesson study is conducted through scaffolding method. The scaffolding method is carried out by giving direction, guidance, encouragement, giving examples, to outlining the learning steps so that students can grow independently. Master students direct the undergraduate students to find problems in the learning process in the 21st Century Biology Learning class, then ask students to find solutions to the problems.

2 METHOD

The type of this research is classroom action research with qualitative descriptive approach. This study is conducted in two cycles, where in each cycle there are four stages: planning, action, observation and reflection. In each open class two Lesson Study processes are performed. The first lesson study was conducted by lecturer with three master students. The results of the first lesson study then implemented to guide the undergraduate students in implementing the second Lesson Study. The first and second Lesson Study consist of stage plan, do, and see. Summary of the research activities are shown in Table 1. The subjects of this study are 31 students of biology education courses, who took biology learning of 21st century course.

The Lesson Study implementation data comes from the clinical supervisor and the Lesson Study member of undergraduate students. These data were obtained from the monitoring sheet of the plan, do, and see activities filled by the clinical supervisor. The data of learning implementation came from the clinical supervisor. Creative thinking skills data were obtained from the results of the Mind Map assessment made by the students at each meeting. Qualitative data of creative thinking skills were observed from the activities of Plan, Do, and See which were carried out by groups who taught their friends. The research procedure in this Classroom Action Researh (CAR) is more unique than usual. Researchers here not only guide students in the classroom, but also provide guidance for students who will teach their friends.

The first step of CAR is plan, same like Lesson Study (LS). Master students observe the learning activity to find a problem. After that master students and lecturer work collaboratively to find a solution. At this step master students decide who will teach and who will observe the learning activity (Amri, 2013).

The second step is action, in LS it called Do. Master students as the lecturer do the action. Master students ask the learning biology of 21st century students to make four groups (the first step of guided inquiry). Each group of bachelor students should observe the 21st century skills weakness of their friends. After they found their friends weakness, they should solve it by doing lesson study (the second step of guided inquiry). After that master students guide bachelor students to make a plan for solving the problem (the third step of guided inquiry). Bachelor

students are asked to implementing their plan for developing their friend's 21st century skills by using a learning model. During the action, the observers observed the learning activity of bachelor students in classroom and outside of classroom –planning step of bachelor students.

The last step is reflection, in LS called See. There are two kinds of See. The first See is held by bachelor students with master students. This activity is conducting after the action of bachelor students. At this step, the next group can find the problem that they should solve. The last step of bachelor degree is writing report. The second See is doing by master students and lecturer. The result of guided inquiry implementation based lesson study is written in this report.

Table 1: Classroom action research plan.

CAR cycles	*Lesson Study*	Topic	LS member	Date of		
				Plan	*Do*	*See*
I (guided inquirybased lesson study)	1	21st century as century of knowledge	Indah Syafinatu Z. Kuni Mawaddah Leviana Erina Lia Kusuma W. Lydia Bayu F. Nikita Rizky	12-13 September 2017	14 September 2017	14 September 2017
	2	Developing curriculum and assessment of 21st century	Amien Fadli Anggun Risma A. M. Nasrul Fuad M Feri S. F. Siti Ma'rifah	29 September & 3 October 2017	5 October 2017	5 October 2017
II (guided inquirybased lesson study)	1	Developing and measuring life skills (ICT: Digital Literacy, Visual Literacy, and Technological Literacy) in 21st century learning	Indah Syafinatu Z. Kuni Mawaddah Leviana Erina Lia Kusuma W. Lydia Bayu F. Nikita Rizky	31 Oktober & 1 November 2017	2 November 2017	2 November 2017
	2	Learning model and method for 21st century learning (Inquiri, *Problem Based Learning* and *Project Based Learning*)	Anisa Fitria Arif Affandi Firda A. Z. Rifda Zulfa Riska May H.	10 & 14 November 2017	16 November 2017	16 November 2017

Table 2: Guided Inquiry-based lesson study implementation.

No.	Cycle I	Cycle II
1.	75%	95%

3 RESULT AND DISCUSSION

3.1 Implementation of guided inquiry-based lesson study

The percentage of instruction in guided inquiry syntax shows an increase from cycle I of 75% to cycle II of 95% , seen in Table 2.

The implementation of the learning process in the first cycle reached 75%. The achievement of syntax implementation does not reach 100% because the clinical supervisor should guide the students who still do not understand the models that will be used in delivering the learning materials. Data collection to prove the hypothesis that has been arranged still not directed. Students who do the modelling have not been able to make records of student activities that are taught. The implementation of the second cycle has reached 95%. Not reaching the syntax until 100% is due to busy students who have to divide the time in implementing the plan with thesis writing interfere with the achievement of syntax. Students are very difficult to be invited to implement the Plan due to their respective activities.

3.2 Lesson study implementation

The implementation of the Lesson Study is derived from the monitoring sheet of the Lesson Study which is filled by the observers. The analysis was done by dividing the scores obtained with the maximum score then multiplied by 100%. The results of monitoring

the implementation of Lesson Study can be shown in Table 3.

Based on Table 3, it can be seen that all the stages of Lesson Study have been done well. The average of the implementation of the plan phase is 92.18% which is included in the criteria of well done implemented. The average of performing stage is 91,61% which is included in the criterion of well done implemented. The average implementation phase of the see stage is 100% which falls into the criteria of well done implemented. Lesson Study in this study is very helpful for clinical supervisor in knowing the problems that are not observed by the

Table 3: Monitoring result of lesson study implementation.

Lesson Study	The score of Lesson study implementation steps					
	Plan (%)	Criteria	Do (%)	Criteria	See (%)	Criteria
1	87,50	Well done	82,35	Done	100	Well done
2	93,75	Well done	94,12	Well done	100	Well done
3	100	Well done	100	Well done	100	Well done
4	87,5	Well done	90	Well done	100	Well done
Average	92,18	Well done	91,61	Well done	100	Well done

clinical supervisor, especially information about the student learning process during learning process take place. Clinical supervisor can improve learning based on information submitted by the observers about student learning activeness. In addition, the stage that can be done after the activity can be used as the basis for the preparation of the lesson plan for the next meeting. The success of learning cannot be separated from the information as advice and input from the observers and supervisors in the stage of See.

Lesson study guides clinical supervisor what to focus in discussing about plan, do, and see on classroom learning (Kuramoto and Huiting, 2012). Plan was conducted for discussing about the preparation of learning scenarios, where LS members provide advice to teacher model who will teach in open class, resulting in good planning and can achieve the learning objectives to be delivered in the classroom. In this research, the stage of the plan is also to produce lesson plan which contains detailed learning scenarios and operational steps, other learning tools, such as student worksheet, scoring and evaluation format, preparation of instructional media, and agreement of members who will become teacher model. This is in accordance with the importance of the plan described by (Susilo, Chotimah and Sari, 2011) that the plan aims to produce a learning design that is believed to be able to teach students effectively and generate student participation in learning. This planning is done collaboratively by several teachers who belong to a Lesson Study group. Usually it was established first who among the LS team who will become the teacher (teacher model), then the clinical supervisor compile lesson plan. The teacher then meet and share ideas to refine the design of learning that has been drawn up by teacher model to generate ways of organizing teaching materials, learning process, and preparation of learning aids that are considered the best. All components contained in this learning design are then simulated before being implemented in the classroom. At this stage also set observation procedures and instruments required in the observation. Plan, do, see, activities are shown in Figure 1.

3.3 Creative Thinking Skills

Lesson study can help pre service teacher to improve their creative thinking (Adams, 2013). The percentage of students' creative thinking skills showed improvement in the first meeting and the last meeting, but experienced a decrease in the second and third meetings shown in Table 4.

The improvement of students creative thinking skills has been seen from 71% become 76%. However at the second and third meeting there was a decline. This is because some of students do not gather their mind map to the clinical supervisor. Another reason that causes CTS decrease is LS team choose a wrong model to teach their friends. Lesson study team does not develop creative thinking skills, they develop communication skills.

Mind map created by students shows the level of creativity of the students. The highest aspect of students' creative thinking skills is the fluency aspect. Students are very fluent in mentioning the branches of the mind map they have built. (Buzan, 2006; Evrekli, Balim and İnel, 2009) state that branch-level growth outward shows the number of creative ideas added in the mind. Making a mind map that is done independently trains students' interpersonal intelligence. This intelligence raises the confidence and belief in the ability that is owned (Dewi and Indrawati, 2014). The lowest aspect of creative thinking skills is elaboration. Students still have difficulties in giving illustrations of each branch they make, students tend to write only words without

giving illustrations in the form of figure or other information.

Improved mind map results show that students are increasingly skilled in creative thinking. These results are consistent with the research of (Keleş, 2012) which concludes that mind maps are an effective and positive learning medium for enhancing student creativity demonstrated through the use of color and mind map form. (Wang, Lee and Chu, 2010) also stated that the use of mind maps makes it easier for a person to remember information. The problem of students' creative thinking skill can be overcome with guided inquiry

Figure 1: Plan, do, and see activities.

Table 4: Creative thinking skills (CTS) of students.

CTS Aspects	Cycle I		Cycle II	
	MM1	MM2	MM3	MM4
Elaboration	66	63	63	68
Fluency	80	81	78	85
Flexibility	62	64	68	75
Originality	73	73	71	74
CTS scores	71	70	70	76

learning model. The ability of students in designing learning activities has increased. At the first meeting of group 1 consisting of Kuni, Nikita, Lia, Lidya and Levia are still confused how to start designing a lesson plan. The clinical supervisor responds to the student's inclination, so the clinical supervisor gives the question of herding as "how are the characteristics of the material you will convey?" Kuni replied "the characteristics of the material we will convey are still just reading, and we have difficulties in finding the material we will convey we've searched on wikipedia and other sources but none ". Clinical supervisor suggest "you should not be fixated on the source of Indonesian language, because very few Indonesian resources who discuss about it. Try to search with the English keyword." In the next meeting, this first group had finished designing chapter design, lesson design, student's worksheet and papers that become teaching materials that they will use.

The second group consisting of Siti, Anggun, Amin, Fuad, and Fery. This group was more creative than the previous group. This second group learnt from previous group experiences and instantly determines the issues they will pick up. The material to be taught by group two was curriculum development. The creativity level of the second groups was higher than the first group by designing the learning that produces the product in the form of a poster.

The modeling group at the third meeting was still the same as the second meeting, but they did not produce the product. At this meeting the second group more focused on the demonstration of student communication skill development, so the method chosen was the method of debate.

The fourth modeling group is Alfan, Firda, Rifda, Anisa and Ayu. The motivation of this group in implementing the plan were very low, but when the lecturers provide the stimulus in the form of questions they start to give a positive response. The level of student creativity in this last group was the same as the first group. However, the efforts of this group have been maximized.

4 CONCLUSION

Based on the research results it could be concluded as follows. Guided inquiry-based lesson study can improve students' creative thinking skills. This can be known from the results of mind map assessment in the first cycle of 70% increased to 73% in cycle II or experienced an increase of 3%. With the Lesson Study, lesson plan can be produced well so that the

model lecturers can be better prepared to do the learning and can make students more able to empower the creativity of students in designing learning activities.

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