

Implementation of an Inquiry Learning Model Based on Lesson Study as a Way of Improving Learning Outcomes on Contents Structure and Function of Plant Tissue to Students Senior High Schools in Malang Regency

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Abstract: The observations and interviews with teachers and students of senior high schools in Malang Regency showed that 1) the teachers were implementing the curriculum of 2013, 2) the teachers had already implemented the practical methods yet had not applied the scientific approach, 3) they had not followed the scientific approach of learning process by not implementing performance assessment yet. While result of student interviews showed that the students were bored with the biology lesson due to the many contents that must be memorized. Based on the need analysis which had been done previously, it is necessary to study the implementation of inquiry-based learning according to lesson study in order to improve learning outcomes of the senior high schools in Malang Regency. The method which was used through lesson study activities together with the teachers of senior high schools in Malang Regency, comprised of three stages, namely, plan, do and see. The research was conducted in the 11th Grade of MIA in Malang regency with a total population of 180 students, started from 5th to 28th August 2016. The research was collaboratively conducted within the Biology Teacher Development Group (MGMP) in Malang regency. The lesson study consisted of three cycles. Cycle 1 was conducted in SMAN I Lawang, cycle 2 was in SMAN Kepanjen, and cycle 3 was in SMAN I Bululawang. The instruments used were the observation and interview sheets. The conclusion demonstrated that the implementation of guided inquiry model through lesson study could improve students' learning outcomes, which included the cognitive competence, observation skill by using microscope, and communication skills of 11th Grade students of MIA in Malang Regency.

Keywords: inquiry, lesson study, learning outcomes, senior high schools in Malang regency

In The Ministerial Regulation No. 22 OF 2016 there is shown the learning process that is supposed to be held interactively, inspirationally, favorably, efficiently, and motivating the students to take active participations, as well as providing adequate space for students' creativity and independence. In order to implement these principles in learning activity, the students need to be fully involved to discover a certain concept by their own, while teachers only play a role as the facilitator and moderator. However, the facts in the field have not directed the proof of meaningful learning. Llewelyn (2013) stated that one mode of meaningful learning is inquiry learning. Inquiry learning model is a learning process in which the students takes active participation to gain information and obtain their own knowledge by conducting observation or discussion in order to get a more meaningful learning. This result could be obtained because every stage of inquiry learning is based on the scientific work phases which are able to develop the students' scientific attitudes as well as their scientific skills. Also inquiry learning model emphasizes on systematic, critical, and analytical thinking process to search and discover the answer of the problems they deal by themselves. Therefore, it is expected to be able to grow the students' confidence and awareness toward the meaning of life.

Seraphin (2012) stated that in the learning process and science assessment, including the subject of biology taught by the teacher in high schools, memorizing system is still dominating thus the students' thinking processes are not developed well. Biology learning is supposed to be based on the principle of process skill. The students are supposed to be taught to independently find and develop the fact and the concept. The same condition occurred in various high schools of Malang Regency. From the result of interview and observation in March-April 2014, there was found the condition of some high schools in Malang Regency: 1) the teachers had not systematically implemented scientific approach, 2) the measured value was only in low-domain cognitive, 3) the teachers had not comprehended performance assessment that could be used to measure the good learning achievements, either the competence in attitude, skill, and knowledge. Besides, the interview with students showed that biology subject was still considered boring by many of the students. It was because the teaching and learning processes in class were more directed to students' skill in memorizing, not to the analytical, critical, and systematic process of thinking.

On the other hand, commonly the biology teachers in Malang Regency's high schools were emphasizing more toward material delivery and those were not associated with daily life contexts. As the consequence, the materials were considered abstract and hard to understand by students. One of the examples was from The Basic Competence 3.4., which is the material of the plant's tissue structure and function. In the core activity, the students gain their learning experience by working on students' worksheets. The sheets consisted of pictures of the plant's organs which are composed of tissue structure. Then the students are asked to determine the composer of the outermost plant's tissue until the innermost part. In other learning process there is already practicum method which having the students to conduct observation through microscope. The students do not make their own preparats from the observation material, which is the organ preparat of some certain plants, but use the preserved preparat instead. This will lengthen the gap of science world with the students' realm. Whereas, science could be explored from the students' actual daily life, and this could grow their learning motivations. Crawford (2007) added that the teachers are not ready with such a complex condition thus it is hard for them to design a meaningful learning. The factors affecting the success of teachers in inquiry-based science learning are as the following: 1) the contradictory views among the teachers in school; 2) students' characteristics; 3) the material; 4) the teachers' educational background; 5) teachers' confidence and experience in scientific research. As the effort to overcome these factors, the lesson study-based Biology Teacher Development Group (Musyawarah Guru Mata Pelajaran or MGMP) is needed.

MGMP is a highly effective media for enhancing the competence and professionalism qualities of teachers. This could be seen from the mission and function of MGMP, which becomes the place for teachers to improving their motivation, communication, and studying their difficulties in class, as well as to sharing thoughts in designing learning model effectively and efficiently, in comply with the applicable curriculum (Mulyasa, 2008). Syamsuri and Ibrohim (2011) stated that *lesson study* is the coaching model for educator profession through collaborative and sustainable learning study which is based on the principles of collegiality and mutual learning, as well as to build the learning community. Susilo added one reason of lesson study's importance is that through lesson study activity, the teachers collaboratively try to translate the education's objective and standard into the reality in class. It is begun with the activity of *Plan*, planning the learning equipment; *Do* (conducting) and *See* (observing and reflecting the result of observation). This is suitable with 21st century learning which emphasizing on collaborative learning study.

RESEARCH METHOD

The research was conducted in the 11th grade of MIA in Malang regency, with a total of 180 students, from 5th- 28th August 2016. This research was based on lesson study, comprising three stages which namely, *Plan*, *Do* and *See*. The research was collaboratively conducted within Biology teacher's MGMP in Malang regency. Lesson study consisted of three cycles. Cycle 1 was conducted in SMAN I Lawang, cycle 2 was in SMAN Kepanjen, while cycle 3 was in SMAN I Bululawang. The lesson study consisted of three meetings for each school. There were two classes used as two groups, namely the experimental group and the control group. Overall, there were 18 meetings of lesson study.

The instruments that were used in the research are: 1) Cognitive test problem to know the students' cognitive achievement. 2) Learning observation sheets to measure the learning activities. 3) the data of the lesson study which were obtained from observation sheet, interviews with teachers and students, and field note of the lesson study implementation. The data were analyzed by applying data reduction technique. Then it was concluded in qualitative way.

RESULT AND DISCUSSION

The implementation of lesson study is supporting and accustoming the teachers to implement guided inquiry model in the material of The Plant's Tissue Structure and Function while teaching in class. The members also conveyed that there were many advantages in terms of developing their professionalism and learning experiences by implementing lesson study. The lesson study was conducted in three cycles. The measured learning outcomes included knowledge, skill in using microscope and communication. The result is shown in histogram of figure 1, 2, and 3.

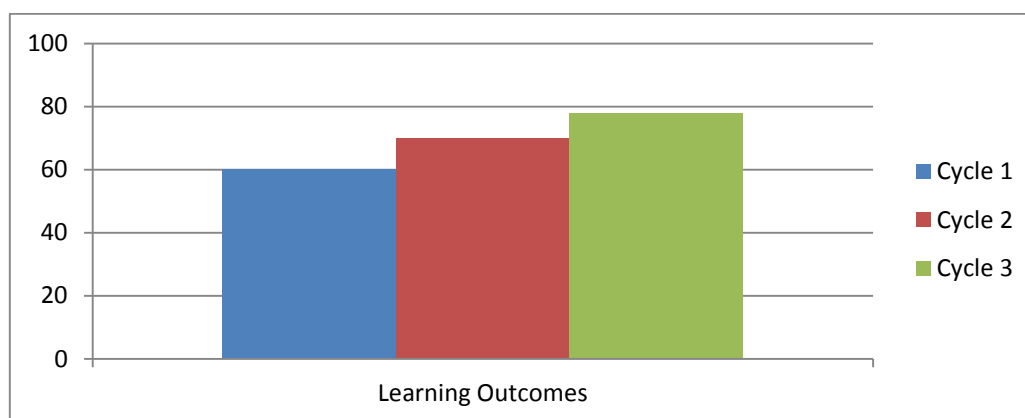


Figure 1 Cognitive competence

The students' cognitive skill average in the cycle 1 was 60. In the cycle 2, the students' cognitive skill increased by 16.7% and became 70. Finally, in cycle 3, the students' cognitive skill increased by 11.4% and became 78. Overall, there was improvement although it was not significant if it was tested statistically. The indicators of students' skills of observation by using microscope were work safety, preparation, making slice, operating, drawing, accurate observation, and cleanliness. The students' skill averages in using microscope in cycle 1 were 64.1. While in the cycle 2, their skills had increased by 24.7% and became 80. Finally, in cycle 3, the students' skills in using microscope increased by 3.6% and became 82.9.

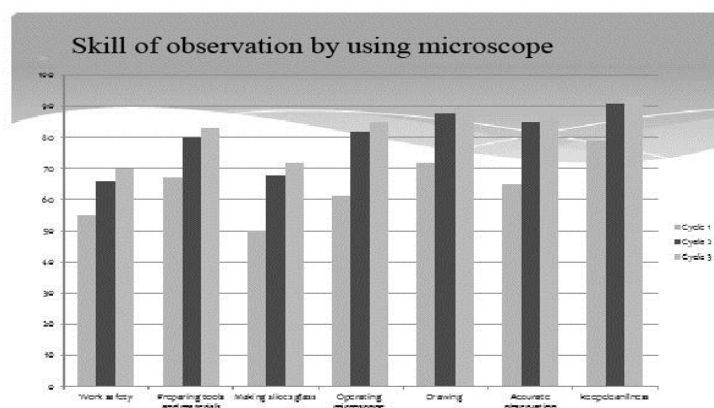


Figure 2: Skill of Observation By Using Microscope

The indicators of students 'communication skill were the clarity in delivering content, depth in argumentation, and respecting others' opinions by using Indonesian language. The students' communication skill average in cycle 1 was 63.4, while in cycle 2 their communication skills had increased to 77.6. Finally, in cycle 3, it increased by 3.9% compared to cycle 2 and raised into 80.6.

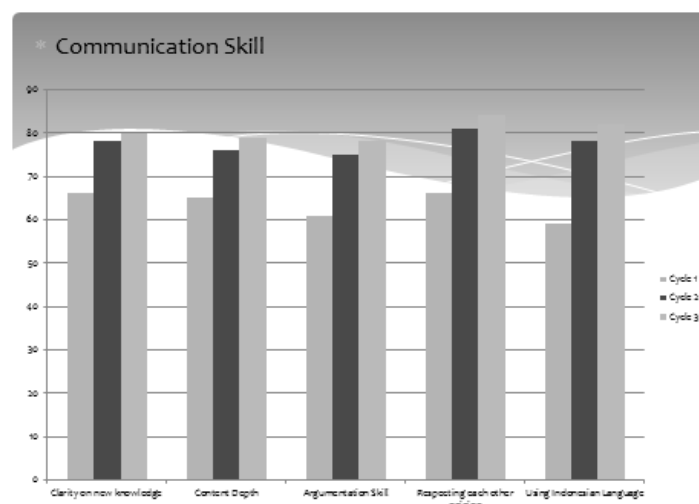


Figure 3: Communication skill

Discussion

The research was conducted in lesson study-based activity in Biology Teacher Development Group (MGMP). Lesson study was conducted in three cycles, each of them consisted of the stage of *plan*, *do*, and *see*. The stage of *plan* in the cycle I was arranging the chapter design and lesson design with a material about the plant tissue's structure and function. From the result of planning stage, especially of the chapter design arrangement, there was found that the teacher still inaccurately formulated the indicator of basic competence. Indicator of competence is the measurable and/or researchable attitude to demonstrate the achievement of certain basic competence, which becomes the benchmark of a subject assessment. This occurred because the teachers in MGMP forum did not have in-depth comprehension toward the material. For that reason the lesson study needed to be conducted by collaborating with the advisors from

LPTK. Ibrohim (2016) showed that MGMP will be more effective if it is made into lesson study-based. In the lesson study activity conducted by the teachers and LPTK lecturers, the teacher will act as the practitioner, while the lecturer will take the role of observer. On the other hand, they could also collaboratively act as the practitioner and observer, hence they could complement to each other. The main activity in developing lesson design was setting the objective of learning. Besides, along with the advisors, the implementation of guided inquiry model in terms of its process and its learning assessment were also discussed.

The guided inquiry learning model is specified to be implemented because it is the model which does not waste time in the learning process. Sadeh and Zion (2012) stated that the application of guided inquiry learning strategy supports the learning process due to its efficiency in time. The learning is initiated by asking question or the problem that is going to be observed by the teacher and showing the material or object that is going to be used. In the next step, the students design and conduct the research procedures. The students then make some conclusions and arrange the explanation from the collected data. Joyce and Calhoun (2000) added that the implementation of inquiry strategy is had better to be conducted gradually, start from the simple step and sustainably lead to the more complex inquiry activity. The stages of guided inquiry model shown by Llewelyn (2013) are as the followings: exploring a phenomenon, focusing on the question, planning the observation, conducting experiment, analyzing data, establishing new knowledge, and communicating the new knowledge.

The steps implemented in the stage of *do* in cycle 1, 2, and 3 were accustomed according to the discussion result in the stage of *plan*; which implementing guided inquiry learning. This inquiry learning model is closely related to the constructivism learning theory that was developed according to Piaget's cognitive development of basic psychology and Vygotsky's scaffolding theory. Constructivism learning theory emphasizes on the process of independently establishing knowledge on students. Dedic (2014) stated that through assignments in the inquiry learning model which copying how the actual scientist works in the simplest and most common form, the students could construct and develop their knowledge on science. In the same time they could develop their inquiry skills, comprehend the nature of science, and think scientifically. Due to complexity of assignment in the inquiry learning, to obtain the required quality, the students have to conduct systematic and reflective approach in order to find the valid and accurate conclusion.

The ultimate lesson study activity is *see* or reflecting from the conducted learning process. The result of reflection showed that there were some problems related to the guided inquiry implementation in the first cycle as the followings: 1) the students had not been skillful yet in using microscope, 2) in the stage two which focusing on the question; it was the mentor who answered the question. While the appropriate stage was the question is supposed to be answered by students in the next stage, which is planning research, conducting experiment, analyzing data, and forming new knowledge. Dedic (2014) stated that misconception occurs in scientific process as the consequence of the teachers who do not understand science well, thus do not often strengthen the thinking habit which is actually required for a scientist.

Actually the problem in inquiry learning strategy is not the mistake of teacher. It is because in traditional learning the teachers have not applied the process of interpreting science to the professional level as what have conducted by a scientist. In the professional level, the scientist will comprehend the overall problem of the complexity and inexactness of science. The teachers need to strive in order to gain more experience to train their scientific thinking habits and apply it into their classes. Based on that reason, the teachers apply the scientific method in several books, like asking question, conducting experiment, as well as getting the finding and conclusion. The outcome is teachers tend to monumentalize the scientists' findings as the exact science. Next, the students will comprehend science as an exact science, has no

change, and owns absolute truth. They do not understand that science is dynamic and will always experience change as time goes by. Due to that kind of condition, the students think that scientific learning process is conducted by memorizing procedures and formulas, in order to find one true answer.

Based on the research conducted in cycle 1, 2, and 3, there were shown learning achievements which included cognitive competence and skill in using microscope and communicating, which although experienced some improvements, yet was not significant if measured by statistical analysis. The main objective of this research was to train teachers in implementing guided-inquiry model along with its assessment. Seraphin (2012) stated that the goal of science learning through inquiry is to build foundation for students so they will have scientific literacy. In this perspective, one most important component of scientific literacy is recognizing and taking role in science as a discipline. The character of discipline includes practice habit, specific language, trust, and communication network. Science as discipline has its own unique point due to its systematic process in discovering the science of nature. Students who have scientific literacy will comprehend that science is not just a collection of fact but also the dynamic process in discovering and developing science which cover the habit of scientific thinking like curiosity, critical analysis, and open toward various ideas. Dedic (2014) also added that through the stage in inquiry learning strategy that copy how the actual scientist works in the simplest and most general term, the students could construct and develop their own knowledge in scientific content. At the same time, they will develop inquiry skill, comprehend the nature of science, and think scientifically. However in reality, the perspective of science as a discipline in learning and assessment process is contradictory with the practice in school in common. As the consequence, the misconception of students whom view science as merely a collection of fact happens.

In the implementation of guided inquiry learning model, there is used performance assessment to measure not only the cognitive competence, but also the skill. Stiggins (1994) expressed that there are some reasons why performance assessment needs to be conducted in school, which are: 1) giving more opportunities for the teachers to recognize their students more intact, due to the fact that not all students who perform less successful in objective test or description test are not skillful or creative. Therefore the students' performance assessment could supplement other methods of assessment. 2). the teachers could observe students' skills during the learning process without waiting until the end of the learning process. 3). they could know better about certain students' skills which are hard to understand just by looking at the written test or their homework final results. The targets that are going to be achieved through performance assessment are: (1) *knowledge*, (2) *reasoning* which means how they apply their knowledge for problem solving context, (3) students' *skills* in asking question, communication skill, their works, and visuals, (4) *product* which means the skill to produce or create various works, (5) *affect* which describes about attitude, interest, value, motivation, and self-concept. The advantage of performance assessment is that this could value the knowledge, attitude, and skill of students. Performance assessment allows the students to show what they are able to do for real. This is based on the consideration that there are difference in knowing how something works and the actual skill of implementing that concept in real life.

Overall, the outcomes of lesson study activities were good. The cycle 1, 2 and 3 got positive response both from teachers and students in 11th grade of MIA Senior High Schools in Malang Regency. Stigler and Hiebert in Susilo (2010) stated that *lesson study* provides the lost "key element" of ongoing education reformation, which is the effective way in improving the learning quality through the development of teachers' professionalism in collaborative way which is based on learning practice. The idea consisted in lesson study is actually so brief and simple, as what was revealed by Lewis (2005): if a teacher wants to improve the learning

quality, one of the clearest methods is by conducting collaboration with other teachers to design, observe, and reflect toward the conducted learning. The main objectives of lesson study are: (1) getting better comprehension about how the students learn and how the teachers teach, (2) getting certain outcomes that give benefit for other teachers in conducting learning, (3) systematically improving the learning process through collaborative inquiry, (4) building pedagogical knowledge where a teacher could gain insights from other teachers.

CONCLUSION

The implementation of inquiry model could improve the students of 11th grade of MIA Senior High Schools in Malang Regency's learning outcomes, which were cognitive competence, skill of observation by using microscope, and communication skill.

Moreover, the activities of lesson study were: improving the instruction quality through continuously collaborative discussions of instructional activities based on the principles of partnership and mutual learning, as well as establishing a learning community.

REFERENCES

- Ibrohim. 2016. *Perkembangan Baru Teknik Lesson Study Mengarah Pada Keefektifan Perencanaan Dan Pelaksanaan Layanan Pembelajaran Bagi Siswa*.
- Sadeh, I, & Michal, Z. 2012. *Which Type of Inquiry Project Do High School Biology Students Prefer: Open or Guided?* (Online), DOI 10.1007/s11165-011-9222-9 Related subject areas: Science Education, Inquiry Pu Sci Educ (42:831–848
- Joyce, B., Marsha, W. & Emily, C. 2000. *Models of Teaching* (6th ed.). Boston: Allyn and Bacon.
- Lewis, C. 2005. *How do teachers learn during lesson study?* In Wang-Iverson, P., and M. Yoshida (Eds.). *Building our understanding of lesson study*. Philadelphia: Research for Better Schools, Inc.
- Llewellyn, D. 2013. *Teaching High School Science Through Inquiry and Argumentation*. USA: Crown
- Seraphin, K.D., Joanna P., Lauren K, & Lisa M. V. 2012. *Metacognition as means to increase the effectiveness of inquiry-based science education Science Education International*, Vol.23, No.4.
- Susilo, H. 2010. *Lesson Study. Berbasis MGMP sebagai Sarana Pengembangan Keprofesionalan Guru*. Malang: Penerbit Surya Pena Gemilang
- Stiggins, 1994. *Student Centered Classroom Assesment*. NewYork: MacMillan College Publishing Company
- Syamsuri, I. & Ibrohim. 2011. *Lesson Study (Studi Pembelajaran)*. Malang: Penerbit Universitas Negeri Malang.
- Dedic, Z.R. 2014. *Metacognitive Knowledge in Relation to Inquiry Skills and Knowledge Acquisition Within a Computer-Supported Inquiry Learning Environment* . Psychological Topics 23 (2014), 1, 115-141 Original scientific paper – UDC – 159.953.5.072-053.5 37.015.3