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Implementation of the Practicum Methods with Guided-Discovery Model to the Student Skill of Science Process

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Info Article	Abstract
	Biology learning in SMA N 2 Batang still emphasized cognitive ability, has not yet oriented on the development of student skill of science process. The purpose of this research is to analyze theimplementation of practicum methods with guided-discovery model on students skill of science process. This research is Pre-Experimental with Pre-Test and Post Test Group Design. The sample was determined by purposive sampling, X MIPA 1 and X MIPA 2 as experiment class-1 and -2. The results obtained from the test and non-test. The result of skill of science process test was analyzed by N-gain. The average of N-gain test results from the experimental class is 11,4% in high category, 64,3% in medium category, and 24,3% in low category. Analysis of post-test result and student observation resulted in good category. The success of this method implementation in MIPA 1 is 95,15% and MIPA 2 is 88,9% with very high category. Students and teachers respond well to the implementation of practicum method with guided-discovery model. In conclusion the implementation of practicum method with guided-discovery model of environmental change material can develop student skill of science process in observing, classifyng, predicting, measuring, concluding, and communicating aspects.

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INTRODUCTION

The curriculum used in Indonesia education is the Curriculum from 2013 Revised Edition, Kemendikbud (2016). The lessonstated in Curriculum 2013 emphasized the process of active learning and student centering, and the learning approach used was scientific approach. Scientific approach was the way that adapt scientific steps in building knowledge by the scientific method (Sudarmin, 2015). Implementation of scientific methods certainskills called skill of science process.

Process skills need in learning. Skills of science process was a skill of finding out or skill of doing investigation (Trianto, 2007). Science learning should be able to develop science skills such as experiments where students arranging hypotheses, do experiment, retrieve data, and communicate written research results (Susanti*et al.*, 2016).

Skill of science process can be developed using learning innovations that can make students more active and students make learn directly, that is practicum method. Practical learning makes learning process more lively and meaningful (Sukaesih, 2011). Skills of science process can also be developed by using guided-discovery learning models. Guided-discovery is a learning model that have the quality student oriented with trial and error techniques and allows teachers to guide students in finding new knowledge (Purnomo, 2013). One of the advantages of guided-discovery model is the optimality of student involvement on learning process and students are guided to find the concept independently (Sulistyowati et al, 2012).

If guided-discovery was plannedproperly, it can encourage and motivate students to practice and apply the knowledge gained into new learning by involving skill of science process (Akinbobobala&Afolabi, 2010). The learning steps of the guided-discovery model are: (1) explaining the goals/preparing the students, (2) student orientation on the problem, (3) Arranging prediction, (4) do the discovery activity, (5) presenting the result in discovery activity, and (6) evaluate discovery activity(Suprihatiningrum, 2013).

Based on a preliminary study at SMA N2 Batang it is known that biology learning has not been oriented to develop student skill of science process. Learning is more often using lecture learning methods, and sometimes using discussion and question answer methods. Munthe (2009) states that the lecture method makes the class monotonous. In addition, according to Dewi*et al.* (2012) learning by lecture method resulted in less satisfactory student learning outcomes. Lesson learned with lecture methods is less effective for developing students skill of science process. Based on student questionnaire results, students skill of science are in sufficient category, then according to the biology teacher, the students skill of science process is lacking. Students skill of science process in SMA N 2 Batang still need to be developed.

Students who have good skill of science process, will learneasily with scientific method (Kuswanto *et al.,* 2017), such as on environmental change materials that been learned in grade X 2th semester. Environmental change materials can be held usingpracticum learning, as already recommended in the syllabus, so can developingstudent skill of science process.

Based on the previous information, it is necessary to know implementation ofpracticum method with guided-discovery model to the students skill of science process. The results of Nasution research (2014) states thatstudy based of practicum skills are effective in improving student skill ofscience process and scientific attitude. Supported also by research of Susanti&Suliyanah (2016), that guided-discovery learning model can improve student skill ofscience process. The purpose of this research is to analyze the implementation of practicum method with guided-discovery model on environment change material grade X SMA N 2 Batang.

RESEARCH METHOD

This research was held in SMA Negeri 2 Batang in the even semester of the academic year 2016/2017. This research applies practicum method based on learning steps of the guided-discovery model according to Suprihatiningrum (2013). Practicum methods with the guided-discovery model is a way of learning where students practice to seek and find the solution of problem by them self with guidance and direction from the teacher. The steps in this research are: (1) explaining the goals, (2) student orientation on the problem, (3) arranging prediction, (4) do the discovery activity, (5) presenting the result in discovery activity, and (6) evaluate discovery activity.The research design used is pre-experimental design with pre-test and post-test group design. The class sample used is X MIPA 1 and X MIPA 2, both used as experiment class. Sampling is determined by purposive sampling technique. The data collected are main data and supporting data. Main data is test results and observation when practicum to measure student'sskillof science process. Supporting data is learning execution, teacher responses, and student responses on the lesson. The test is taken before and after the implementation of the lesson. The observation is taken while the learning takes place, the learning implementation is taken at the end of the learning process of each meeting, then the teacher and student response is taken after the learning process is completed.

The data analysis quantitative from the pre-test and post-test results which then tested the N-gain. The quantitative descriptive analysis from the observation results during the practicum, the implementation of learning, and the students responses. The qualitative descriptive analysis from teacher responses.The indicator of the development on the student skill of science process is seen from the classical completeness of the skill of science process test $\geq$ 70% from the number of students, the N-gain test shows a moderate increase, and the observation result of skill of science process $\geq$ 70% from the number of students is at least good.

RESULTS AND DISCUSSION

This research uses 4 data retrieval techniques that are test, observation, questionnaire, and interview. The value of skill of science process test is obtained from post-test and pre-test. The results of skill of science process tests are presented in Table 1.

Table 1 Recapitulation of Student Skill of SienceProcessTest Result

Variation Sources	Class	
	X MIPA 1	X MIPA 2
Pre-Test Value		
The Higest Value	81	74
The Lower Value	45	40
Average Value	64	57
Classical Completeness	5,7%	0%
Pre-Test Value		
The Higest Value	93	90
The Lower Value	62	57
Average Value	82	76
Classical Completeness	80%	74,3%

Table 1 shows that the results of pre-test and post-test of experimental-1 class (X MIPA 1) and expreriment-2 class (X MIPA 2) after use of practicum method with guided-discovery model is increased, as well as with classical completeness post-test students. Increased of post-test results and classical completeness caused by learning done using scientific method. Students are directed to

analyze the environmental problems surrounding the students as in the Practicum Worksheet as well as find out the answers of the problems through the practicum so that students can find concepts related to the material being studied, that is environmental change material. Practical activities undertaken involve students to do a scientific activity such as observing, classifying, predicting, measuring, concluding, and communicating the results of practicum, so that student skill of science processindirectlybecome honed. This is in accordance with Saptono (2011) which states that biology learning is directed to the process of exploration, investigation, and discovery of a natural phenomenon so that not only facts, concepts, and principles of biology, but also students scientific process ability can be developed. Susanti et al. (2016) also states that guided-discovery learning leads students to perform an activity of discovery and investigation about a concept independently so that student skill of science process can develop.

The results of pre-test and post-test are then analyzed using N-gain to find out the magnitude of the students skill test before and after treatment. The mean of the students N-gain test results is presented in Table 2.

Table 2 Mean of Student N-gain Test Results

Category	X MIPA 1	X MIPA 2	Average
High	17,1%	5,7%	11,4%
Middle	62,9%	65,7%	64,3%
Low	20,0%	28,6%	24,3%

Based on Table 2, the majority of students get gain in middle category, but there are students who have high and low gain too. This is because there are students who can do the post-test well so get a high gain score, and there are also students who have difficulties when doing post-test so that post-test has not been completed, based on the results, this can happen because students find the difficulties during learning.

Difficulties that experienced by students during the learning such as first, the involvement of students in practicum are less, because limitations of the tool make not all students are involved and understand well about the practicum done, so there are some students that not understand the material that use in practicum. Second, less conducive learning, there are students who ask the teacher because they find the difficulies in using the measuring tool. Rifa'i& Anni (2012) states that successful learning requires students to pay attention internal capabilities and situations beyond the student. Third, the ability of each student is different, so that the results of learning are different, such as the statement of Sunarto& Hartono (2008) which states that everyone has a perception about the observation or absorption of an object, so that variation of the value learning results illustrates that there are differences cognitive abilities in each individual. Teachers need to guide students in doing discovery activities, so students not find difficulties. This is supported by the statement of Dewi et al. (2012) that difficulties experienced by students when learning can be overcome by teachers with providing more guidance to the students during the learning process takes place.

The student skill of science process evolved after the implementation of the practicum method with the guided-discovery model, this supported by post-test results that presented in Table 3.

Table 3 Results of Post-Test Analysis Skills of Student Science Process Per Aspect

No.	Skill of Science Process Aspect	Percentage of Score		Average	Category
		X MIPA 1	X MIPA 2		
1.	Observing	85,7	91,4	88,5	Very Good
2.	Classifying	87,1	67,9	77,5	Good

No.						
3.	Predicting	88,9	81,8	85,3	Very Good	
4.	Measuring	77,1	92,7	84,9	Very Good	
5.	Concluding	77,1	61,4	69,2	Good	
6.	Communicating	79,8	70,5	75,1	Good	
	Average	82,6	77,6	80,1	Good	

Based on the test results, the average of student skill of science process 80,1% with good category. The average of student skill of science process per aspect are also in good category, even very good. This can be interpreted that the student skill of science process are better than before the implementation of learning. The student science skills was develop, italso can be seen on the observation result of studentsskill of science process whenpracticum, that presented in Table 4.

Table 4 Observation Results of Student Science Skills on Practicum

No.	Skill of Science Process Aspect	Percentage of Skill of Science Process in Fist Meeting		Percentage of Skill of Science Process in Second Meeting		Average	Category
		MIPA 1	MIPA 2	MIPA 1	MIPA 2		
1.	Observing	70,0	67,1	92,1	89,3	79,6	Good
2.	Classifying	68,6	62,9	90,7	80,7	75,7	Good
3.	Predicting	76,4	71,4	92,9	85,7	81,6	Very Good
4.	Measuring	60,0	67,9	79,3	82,1	72,3	Good
5.	Concluding	42,9	60,7	64,3	85,7	63,4	Good
6.	Communicating	64,3	50,0	71,4	63,6	62,6	Good
	Average	63,7	63,3	81,8	81,2	72,5	Good

The average result of student skill of science process observation is 72,5% with good category. Post-test results and observations show that student skill of science process in the experimental class are growing and becoming excellent and even excellent after doing activities used practicum with guided-discovery model.

The discovery activity in this research was did in based on syntax of guided-discovery model according to Suprihatiningrum(2013), that is: (1) Explain the purpose. Teachers explain the learning objectives to be achieved by students, so students can know well the things that must be learned for the achievement of planned learning objectives. (2) Student orientation on the problem. Students are given problems, then analyze the problem by doing the practicum. Students are involved in finding answers to the problems that presented sothey cause student skill of science process develop. Mulyono et al. (2012) states that students who find the real scientific problems then solve problems, that will be able to improve students scientific skills. (3) Arranging the predictions. Student make a prediction, this activity honed the students predicting skills. (4) Doing discovery activities. Discovery activities did with practicum of water and air change quality. Activities undertaken by students honing skills to observing, classifying, and measuring. (5) Present the results of discovery activities. Students present the results and conclude the discovery activities undertaken, it hones the student skills of concluding and communicating. (6) Evaluate the discovery activities. Teachers evaluate the results of observations that have been presented by students, as well as teachers conclude the observations made, so the conceptual equations obtained by students. This is evidenced by the results of the implementation of the lesson shown in Table 5.

Table 5 Implementation of Experimental Classroom Learning

Meeting	X MIPA 1		X MIPA 2	
	Learning Implementation (%)	Category	Learning Implementation (%)	Category
1	92,3	Very High	84,9	Very High
2	98	Very High	92,9	Very High
Average	95,15	Very High	88,9	Very High

Implementation of experimental class learning is very high, it meansthat learning has been done well in accordance with the syntax of learning that implemented. The practicum activities in environmental change materials honed basic students skill of science process according to Dimyati & Mudjiono (2002) that is orserving, predicting, classifying, measuring, concluding, and communicating skill.

Student observing skill from test result is average 88,55% in very good category and from observation result is 79,6% in good category. Student observation skills have a very good average based on observation and test results, because the first meeting students are observing the condition of river water samples and second meeting students observed the amount of dust attached to the mica and leaf conditions around the sample location. Observing activity used in forth steps of learning with guided-discovery model.

Students really expected to observe well so can distinguish the condition of various samples observed. Observation activities involve students to use the senses that are possessed maximally such as the sense of sight and smell (first meeting) and the sense of sight (second meeting) so that the observations obtained by students can be in accordance with the facts. Anifah (2015) states that if students are able to observe well then students observing skills and other process skills will be able to develop.

Student classifying skill from test result get score 77,5% and from observation obtained score is 75,7% in good category. The first meeting, student classifies the river water conditions that observed and the second meeting classifies the air condition in the sample environment. Classifying skills used in forth steps oflearning, that is do the discovery activities. Students classify in a way to find out the similarities and differences sample based on observations and measurements result. It can hone students classification skills. Rahmawati&Sukaesih (2014), stated that if presenting some objects when the lesson, then observed and grouped by students based on similarities and differences, it can lead to increased student classifying skill.

Students predicting skill from test result is 85,35% in very good category and from observations result is 81,6% in very good category. Predicting skill used in arranging prediction activities (third steps on learning). Predicting skills are excellent,because students are guided by teacher to make predictions. Students make predictions based on the characteristics contained in the problems that presented and analysis result of river and environmental conditions beforedo the discovery activity. Because of the prediction making process, student predicting skill to develop. Based on research Sedana et al. (2016), it is known that science learning trains students to make predictions in learning, thus causing the students predicting skills to increase.

Student skill of measuring from the test result is 84,9% in very good category and from the observation is 72,3% in good category. Measuring skill used in forth steps of learning, that is

discovery activities. The teacher guides the students to conduct measurement activities. Students measure the degree of acidity (pH) of river water and the frequency of closed and open fish gill operculum (first meeting) using universal pH indicator and hand counter, also measure the amount of dust (second meeting). Students become accustomed to using measuring tools and actively performing measurements in the learning, so causing students to feel more inquisitive and try to make good measurements to know the differences about various samples that observed. It has an impact on the measuring students skill for the better, this is supported by Yusnira (2015) which states that the learning that makes students active can improve the skills that students have, such as when measurement activities using the tool, indirectly the skills to measure students become honed due to measurement activities undertaken.

Student skill of concluding from test result is 69,25% in good category and result of observation is 63,4% in good category too. Skill of concluding used in fifth steps of learning that is presented the result of discovery activities. Studentsskill of concluding skillbefore implemented learning in sufficient categories, after implemented learning, student skill of concluding be better. Teacher guides students to make conclusion when practicum, so students become more accustomed to concluding. Learning by practicum causes studentskill of concluding is increase, because students are accustomed to adjust between the conclusion their made with the goal to be achieved (Wasilah, 2012).

Student skill of communicating from test result is 75,15% in good category and from the observation is 62,6% in good category too. Skill of communicating used in fifth steps of learning that is presented the result of discovery activities. Each group presents the results in front of the class, soaffected in communication skills of students become honed and developed. Kurnianto et al. (2010), that the student skills of communicating be better by implemented of the practicum on learning, students in each group active to presented the results obtained during the observation.

Based on the results of the tests and observations of student skill of science processis develop, the development from highest to low is observing, predicting, measuring, classifying, communicating, and concluding skill. There is a tendency for students to have higher test scores than observation scores, higher observation scores than test scores, and test scores equal to observation scores. The student's test score is higher than the observation score, because the student cognitive ability is better than the psychomotor ability. Students like this is disposed to be learn the material well, but when student prensented with a practice lesson, students can't perform well. While students who have a lower observation score than the test results causes by students psychomotoric ability is better than cognitive. Students like this is disposed to doing activities that involve physical work (hands on) rather than cognition (minds on). Students can practice well but if do with something that demands to think, students have problems. Students who have same scores between test and observation results mean that students psychomotor skills are good, then it will affect their cognitive ability. Students can apply the information obtained when learning with practice to answer the questions, so students can do the problem well. Students who have balanced cognitive and psychomotor skills, both of can potential for growth. Hendriyan (2013) states that the success of the cognitive will have an impact on the psychomotor development of students and the other way.

Based on the research that has been done, there are advantages of biology learning using practicum method with guided-discovery model such as (1) students are more enthusias to find the cause and impact of a problem by doing self-discovery, (2) there are cooperation between group members and they shere information between each group so they canfind answers that been soughtt, and (3) students just like scientists who discover the concept by their self discovery.

Implementation of practicum method with guided-discovery model get positive response from teachers and students. Teacher states that the implementation of practicum method with guided-discovery model makes the lesson become more effective,thestudentsbecome active, motivated, and

focused in theirlearning. Supported by Drucman's (2017), that discovery learning can make learning effective and highly impactful to increase students understanding of concepts. Students also respond positively to the learning method that applied, marked by the results of questionnaire responses of students on learning scored 95% with very good category.

CONCLUSION

In conclusionthe implementation of practicum method with guided-discovery model can develop student's skill of science in observing, classifying, measuring, concluding, and communicating aspects on environmental change material in SMA N 2 Batang. The higest developing skill is is observing.

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