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Improving the Skill of Physics Science Process through Guide Discovery Method in Students at Senior High School

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***Abstract*—This research is Classroom Action Research, which includes planning, action, observation, and reflection. Actions are made to obtain an overview of the application of guided discovery methods in improving the skills of the physical science process conducted in two cycles. This research was implemented in SMA Negeri 1 Kolaka class XI IPA 1 in the second semester of academic year 2015/2016. The results showed that in the first cycle the average score is 30.9; the second cycle got an average score is 91.8. The increase of the score in each cycle is 78.18%. It means that there is an improvement in the Physics Science Process skills of Learners. Furthermore, the observation of teacher and learners activity shows the implementation. This research concludes that the applicated of guided discovery method can improve the Physics Science Process skill in second-grade students of IPA 1 at SMA Negeri 1 Kolaka by observation, formulating problems, proposing hypotheses, planning problem solving, conducting experiments, observing and collecting data, data analysis, drawing a conclusion.**

Keywords—improving, the skill of physics science process, guide discovery

I. INTRODUCTION

In curriculum 2013, physics is one of the subjects in senior high school and Junior high school. The objectives are: 1) to provide opportunities for students to develop their interests in a group of subjects according to their scientific interests in universities, and 2) to develop their interest in a particular discipline or skill. Based on the description above, the Physics is important to be taught. Furthermore, Wang et al. [1] said that the students could develop their knowledge and ability to face the problem in the world. The Physics also supported by the standards of achievement at Senior high school and Junior High School.

The curriculum 2013 has three domains, namely attitude domain, knowledge domain, and skill domain. In the domain of knowledge explains that the qualifications of students' abilities are able to have factual, conceptual, procedural, and metacognitive in science, technology, and culture. Furthermore, the domain of skills emphasizes students to have effective and creative thinking as the development of what they learned independently in school [2]. To get the standard of achievement in physics, the students should be directed in discovery learning; this is in line with the Curriculum 2013 which uses a scientific approach and National Science Teaching Standards .

The learning process, especially in physics, has a step that explains the skill aspect. Skills - these skills called science process skills. Driver [3] learning science will be meaningful if the teacher carries out teaching and learning activities by developing the science skills of their students. Learning with science skills enables students to learn concepts as a goal of learning science, and it can develop the basic science skills, scientific attitudes, and critical attitudes.

The condition in Senior High School of Kolaka especially class XI IPA 1 is still far from the ideal condition. Their ability about the concepts of physics is still low because of the results of the average only 44.60% in the second semester of academic year 2015/2016. In addition, the number of students who achieve the KKM is about 75%. To achieve the criteria of success in physics, the students need support from teachers and stakeholders. One of the most important things that students must have especially in physics or science subjects is process skills because process skills include domains of attitudes, knowledge, and skills have a contribution to students' learning in school. Based on the explanation, one of the learning methods that help students to increase their ability in science process skills is Guided Discovery.

The problem in this study is How to improve the process of physics science skills through the application of guided discovery methods in class XI IPA 1 SMA Negeri 1 Kolaka Academic Year 2015/2016? The purpose of this research is to explain the application of guided discovery methods in improving the process of physics science skills in class XI IPA 1, Senior High School of Kolaka in Academic Year 2015-2016. The results are expected to give benefit to students, teachers, school and other researchers. For students, this study can develop students' critical thinking skills. So, they can solve the problem in daily activity as a scientific community. For teachers, this study can develop the teacher's pedagogic, so they can make various learning innovations in the classroom and can motivate teachers in

other fields of study in the classroom learning process. For schools, this research can be a reference for the stakeholder in the school to make some policies related to the classroom learning process.

II. Research Method

Design of the research is Classroom Action Research (CAR). Classroom action research is a research that aims to improve performance, contextual and the results are not generalized. Researchers are involved in each stage of CAR such as planning, implementation, observation, and reflection. It also focuses on the learning process in the classroom and focused on assessing the problem that happens in the classroom. The subject of the study was students of class XI IPA 1 Kolaka Senior High School in Academic Year 2015/2016. It consists of 30 students, 5 men, and 25 women.

This study was conducted in two or more cycles, and it starts in the planning, implementation, observation, and reflection. However, if the results of the study do not achieve the criteria of success, it will continue to the next cycle. It can be seen in Figure 1.

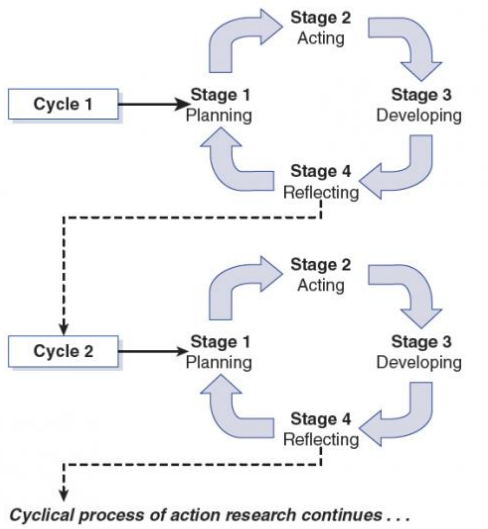

Fig. 1. The ongoing, cyclical process of action research [4]

Data collection was used in this study: 1) Observation sheets were used to collect data based on teacher and students activities in the classroom; 2) Data of the learning process by using guided discovery methods through observation sheets filled by students at the end of each meeting; 3) Data of scientific process skills test would explain in an essay, and it was written by students at the end of each meeting. Data analysis techniques of this study are qualitative and quantitative descriptive analysis. Qualitative data are analyzed based on observations, and quantitative data will be analyzed based on the results of science process skills. The study will succeed if the average score of the physical science process skills reaches at least 60% (maximum score can be achieved)

III. Results and Discussion

Cycle 1 was held on Saturday 27 February 2016 until Saturday, March 12, 2016. Each meeting of the cycle, the activities of teachers, students would be observed through the students' responses in learning. In the beginning, the teacher asked the students to pray before starting the learning and explain the material. Then, Students are divided into 5 groups; each group consist of 6 heterogeneous students and distributing of Student Worksheet (LKPD). At this stage, some students still late to enter the classroom and some students still lack attention to the explanation of the learning material from the teacher. In addition, a few students did not know clearly about the member of groups, so when they asked to regroup, it seemed less organized.

A. Description of results

1) Cycle I

a) Observations of teacher activities. Based on the data observation conducted by an observer about the implementation of guided discovery methods in Cycle 1, it can be seen in Appendix 9A page 170. The implementation of the teaching and learning process conducted by the teacher is observed by 2 observers during the learning process.

b) Observation of Student Activities

TABLE I. Observation Results of Learning Implementation (Students) Cycle I

Groups	Implementation		
	Meeting 1	Meeting 2	Meeting 3
I	Success	Success	Success
II	Success	Success	Success
III	Success	Success	Success
IV	Success	Success	Success
V	Success	Success	Success

c) Score Results of Student Worksheet (LKPD)

TABLE II. Score Recapitulation of Student Worksheet (LKPD) Cycle I

Groups	Score			Average Score Indicator		
	LKPD 1	LKPD 2	LKPD 3	LKPD 1	LKPD 2	LKPD 3
I	47	40	36	4.3	4.0	4.5
II	50	38	31	4.5	3.8	3.9
III	45	43	27	4.1	4.3	3.4
IV	41	37	30	3.7	3.7	3.8
V	47	38	32	4.3	3.8	4.0

d) Results of the Science Process Skills Test in Cycle I

TABLE III. Table of Results of the Average Score of the Physics Science Process Skills Test for Students in Cycle I

Physic Science Process Skills Indicator	Average Score	Ideal Score
Observation	2.73	5
To Formulate Problems	4.90	10
To Formulate Hypotheses	4.10	10
To Identify Variables	5.53	10
Planning an Experiment	5.17	10
Making conclusions	6.80	10
Prediction	1.67	5

e) Student Response Results in managing to learn at the end of learning in Cycle I

TABLE IV. SCORE RECAPITULATION OF STUDENT CYCLE I RESULTS

	Score			
	Meeting 1	**Meeting 2**	**Meeting 3**	**Total**
Score	558	568	574	1700
Ideal Score	600	600	600	1800
Average	27.9	28.4	28.7	85.3
Percentage (%)	93	95	96	94
Category	Excelent	Excelent	Excelent	Excelent

2) Reflection

The data in the first cycle will be used as a reflective material for improvement in the next cycle: (1) generally, each groups are difficult to follow the stages of guided discovery method, (2) the teacher did not make learning atmosphere based on discovery method guided, (3) the teacher is difficult to control the students because the number of students in the classroom is not efficient. It can be seen based on the results of the analysis did not reach 100%, (4) the Result of Student Physics Science (LKPD) is still needed to improve. In addition, the completeness of students achieved only 23.33%, and it is still low.

3) Cycle II

a) Description of Action Implementation. Cycle II was held on Saturday 23 April 2016 until Saturday 30 April 2016. Observations were made on teacher activities and student activities. Steps were taken in Cycle II were similar to Cycle I

b) Observations of teacher activities in the management of learning

TABLE V. RESULTS OF OBSERVATION OF LEARNING IMPLEMENTATION (TEACHER) IN CYCLE II

Observation Aspects of Learning Activities	Meeting 1	Meeting 2	Meeting 3
Preliminary activities	Success	Success	Success
Main activities	Success	Success	Success
Closing activities	Success	Success	Success
Classroom activities	Success	Success	Success

c) Observation results of student activities

TABLE VI. OBSERVATION RESULTS OF LEARNING IMPLEMENTATION (STUDENTS) IN CYCLE II

Groups	Implementation		
	Meeting 5	**Meeting 6**	**Meeting 7**
I	Success	Success	Success
II	Success	Success	Success
III	Success	Success	Success
IV	Success	Success	Success
V	Success	Success	Success

d) Score Results of Student Worksheet (LKPD)

TABLE VII. SCORE RECAPITULATION OF STUDENT CYCLE WORKSHEET (LKPD) CYCLE II

Groups	Score			Indicator Average Score		
	LKPD 1	**LKPD 2**	**LKPD 3**	**LKPD 1**	**LKPD 2**	**LKPD 3**
I	50	55	55	5.0	5.0	5.0
II	48	52	55	4.8	4.7	5.0
III	47	55	55	4.7	5.0	5.0
IV	47	53	55	4.7	4.8	5.0
V	48	53	55	4.8	4.8	5.0

e) Student Response Results in managing to learn at the end of learning in Cycle II

TABLE VIII. SCORE RECAPITULATION OF STUDENT CYCLE II RESPONSE RESULTS

	Skor			
	Meeting 1	**Meeting 2**	**Meeting 3**	**Total**
Score	574	567	565	1700
Ideal Score	600	600	600	1800
Average	28.7	28.4	28.7	85.3
Percentage (%)	96	95	96	94
Category	Excelent	Excelent	Excelent	Excelent

f) Results of the Science Process Skills Test in Cycle II

TABLE IX. TABLE OF RESULTS SCORE OF AVERAGE CYCLE II PHYSICS SCIENCE PROCESS SKILLS TESTS

Physic Science Process Skills Indicator	Average Score	Ideal Score
Observation	4.9	5
To Formulate Problems	9.93	10
To Formulate Hypotheses	9.5	10
To Identify Variables	9.53	10
Planning an Experiment	7.97	10
Making conclusions	9.53	10
Prediction	3.7	5

Increasing the average score of physical science process skills can be seen by comparing the average score of physics science process skills in cycle I and cycle II. The magnitude of the increase in the average score of physical science process skills in Table X.

TABLE X. IMPROVED SCIENCE PROCESS SKILLS SCORE FOR PARTICIPANTS IN EACH CYCLE

Cycle	Total Score	Average Score	Improvement (%)
Cycle I	927	30.9	78.18
Cycle II	1652	55.1	

Based on Table X. an increase in the average score of problem-solving skills from cycle I to cycle II was 78.20%. Based on the success indicators that have been set at 60% indicate that the classroom action research conducted can be said to be successful. Improvement of science process skills of these students can be shown based on graphs.

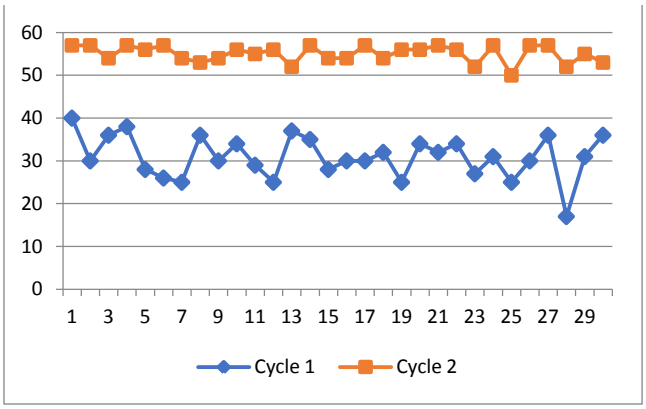

Fig. 2. Graph of improvement of science process skills for students of class XI Science 1 Kolaka State 1 High School from Cycle I to Cycle II

Based on the observations of teacher activities with guided discovery methods as shown in Appendix 9A page 170 in Cycle I, it was found that. In the beginning, the teacher asked the students to pray before starting the learning and explain the material, give motivation to the students, then, Students are divided into 5 groups, each group consists of 6 heterogeneous students, and the teacher distributes LKPD. The point of activities were students can formulate the problems, asked students to formulate hypotheses, give an explanation to students and allow the students to draw conclusions,

Based on the observations of the activities of students in learning with guided discovery methods in Cycle II as in Appendix 9B page 171 it appears that the activities of students have been carried out. The activities of students in the teaching and learning process are reviewed individually and in groups conducted centrally on the students themselves in applying the concepts that are taught, and educators only act as facilitators in guiding and planning activities carried out by their students. This is consistent with the findings of Montessori [5], [6] which asserts that students have the ability to learn to develop themselves, form themselves and find themselves. Educators only act as mentors and observe how their students develop. This shows that learning activities are dominated by students while educators only provide guidance, direction and planning all activities carried out by students during the learning process in finding concepts.

After carrying out the learning process with guided discovery methods, it appears that the score of the science process skills of students from cycle I to cycle II has increased. This was obtained based on the results of the analysis of the LKPD of each group and the results of the students' Physical Science Process Skills test that had increased. The indicators that have increased include Observation, Formulating Problems, Formulating Hypotheses, Identifying Variables, Planning Experiments, Making Conclusions and Predicting.

In cycle I the response of students is not too high in percentage; this is because students are not familiar with the guided discovery method conducted by the teacher. In cycle II the response of students has increased from cycle I, this is because students are already familiar with the guided discovery method conducted by the teacher. In general, for the whole statement in the response of students, the percentage increase from cycle I to cycle II. The increase in students' response to guided discovery methods has an effect on increasing the activity and improvement of the science process skills of students. This increase tends to be caused by students already accustomed to the application of guided discovery methods in cycle II, namely by familiarizing students to formulate problems, formulate hypotheses, identify variables, plan experiments, make conclusions, predict, so that they can construct their own knowledge so that there is an increase in skills the science process from cycle I to cycle II for students of class XI IPA 1 of SMA Negeri 1 Kolaka.

IV. Conclusion

Based on the results of classroom action research that has been conducted in class XI IPA 1 Kolaka SMA Negeri 2015/2016 Academic Year, it can be concluded that the application of guided discovery methods can improve the process of physics science skills. The method used is to maximize classroom management by providing guidance to each group so that students are able to work together to conduct learning activities to investigate problems in each indicator of physical science process skills. Then, students present their findings in groups and work on individual science process tests at the end of learning. Thus, students can construct knowledge about physical science process skills independently through guided discovery methods according to the learning material provided. Based on the results of the research obtained, it is suggested that: 1) The results of this study indicate that learning Physics with guided discovery methods can improve science process skills, so it is expected that teachers / educators can apply this learning model to the appropriate material; 2) Schools should facilitate further research interests so that they can contribute positively to the school and the quality of its graduates.

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