



## The Effectiveness of Guided Inquiry Learning with JAS Approach on the Learning Result of Environmental Pollution Material

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### **Abstract**

This research aims at finding out the effectiveness of guided-inquiry learning model with Natural Environment Exploration (JAS) approach on students' learning result of environmental pollution material. This recent study was conducted in MAN 1 Pati in the odd semester in academic year 2017/2018. The research design applied is non-equivalent control group design. The population for this research is the whole students in X MIA MAN 1 Pati which is divided into 5 classes, while the sample taken for this research was X MIA 1 and X MIA 4 selected by using purposive sampling technique. The result of this study showed that 86.96% of students in experimental class achieved score  $\geq 75$  and there was a difference of mean in the posttest for experimental class and control class i.e consecutively 85 and 75.19. The result of t-test showed  $t_{count} 0.000 < 0.05$  which means there is a significant difference between control and experimental class. It also achieved N-Gain  $\geq 0.3$  with the mean by 0.54. For the class control, 65.38% of students accomplished  $\geq 75$  and N-Gain 0.14. Based on the research result, it can be inferred that guided-inquiry learning with JAS approach is effective to improve students' learning result for the subject material of environmental pollution.

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## INTRODUCTION

Learning is a process undertaken by a teacher to assist students in studying. The learning process is highly expected to have an orientation to student-centered learning with contextual learning nature (Suryani *et al* 2014). Contextual learning is supposed to be applied to Biology learning. Further, Biology relates to curiosity and understanding the nature systematically, so it does not only engage with mastering a set of knowledge such as facts, concepts, or principles but also regards biology as a science which requires discovery process (Depdiknas 2006). Saptono (2009) also finds out that concepts relating to ecology, environmental conservation, and natural resources can be implemented with learning outside the classroom in order that students can directly learn from the real objects.

Based on the result of observation and interview with the Biology teacher from MAN 1 Pati, it is known that biology learning, particularly for the material of environmental pollution, enables the teacher to optimize the learning using the method of speech, discussion, and presentation in the classroom. The use of those methods seems less effective to improve students' learning result because the students are less active during the learning process. This is proved by the result of questionnaires spread out to the students i.e 61% of students feel that they are not active enough in either class or group discussion. In learning material of environmental pollution, students are asked to be able to analyze the environmental changes in their surroundings. Referring to the teacher and the observation result during the ongoing learning process, the difficulties to learn this particular material is that students do not extremely careful to their surroundings or nature. Based on the interview result, it is known that the learning result of students of MAN 1 Pati on the subject biology is 50% of students have achieved the minimum passing criteria score i.e 75.

An effective learning result should be applied in the learning process. Carr (2013) states that teachers are supposed to design an effective learning model in order that students will be easier to overcome the problems of learning which lead to their learning result. Effectiveness in a learning means accomplishing learning objectives in the teaching-learning process (Anggraeni, 2015). One of the effective learning models applied is guided-inquiry learning. Guided-inquiry learning is a learning model which refers to a method to question, seek knowledge or information, and learn a phenomenon (Mu'ayadah *et al.*, 2012). Sotis *et al.* declare that the use of guided-inquiry learning can enhance students' learning result and high-order thinking such as application, analysis, and skill problem-solving.

Biology learning process will be more appropriate if the learning process is conducted in the environment where students can directly engage with nature. The use of the environment as biology learning media expects students to gain concrete learning experiences because they can observe the objects directly to the learning result will be optimal. Natural Environment Exploration (JAS) approach is supported by the environmental condition found in MAN 1 Pati.

MAN 1 Pati is located in the middle of the city of Pati. This location supports the learning source for the subject material of environment pollution. The hot temperature is found in this school because loads of vehicles around the school and much inorganic waste found in the field near the school. The drain in front of the school and several areas of the school are not thoroughly clean from the waste or rubbish. This phenomenon can be students' real learning object.

(Natural Environment Exploration) JAS approach can be defined as a learning approach which utilizes natural environment around the students including physical, social, technological and cultural environment as biology learning object which phenomena can be learn through scientific work (Alimah *et al.*, 2016). The result of a study by Naf'anudiniyah *et al.* (2013) states that cooperative learning with JAS approach is effective in improving students' biology learning result.

Guided-inquiry model with JAS approach is the combination of learning design which enables students to interact directly with biology object. Through this learning, students can gain meaningful learning experience and grow the behavior of environmental care. Furthermore, through this guided-inquiry model with JAS approach, several student potentials have bigger chance to be optimally developed because there will be the real interaction between students and the environment. Students will be invited to the active learning process to create effective learning result. Based on the statements above, the researches about the effectiveness of guided-inquiry learning with JAS approach on learning result of environmental pollution material were conducted.

## RESEARCH METHOD

This research belongs to *Quasi-Experimental* research which is designed with *Non-equivalent Control Group Design*. The population of this research is all students of X MIA MAN 1 Pati in the academic year 2017/2018 divided into 5 classes. The sample of this research is 2 classes taken with *purposive sampling* technique i.e sampling technique done with particular consideration (Sugiyono, 2016). Free variable in this research is guided-inquiry learning with JAS approach on environmental pollution material while the bound variable is students' learning result which covers cognitive aspect supported by affective and psychometric aspects, and controlling variable is time allotment, evaluation test, and teacher. The purpose of this research is to find out the effectiveness of guided-inquiry learning with JAS approach on the learning result of environmental pollution material. The procedure of this research includes three stages; preparation, examination and final research.

## RESULTS AND DISCUSSION

The initiative research data which is the data of pretest result of both classes showed that the beginning condition of both classes is the same. This was proved by the homogeneity result where  $t_{count} 0.239 > 0.05$ . then, the result of students' cognitive aspect is posttest score conducted at the end of the learning process. The posttest score is shown in Table 1 below.

**Table 1** Learning result of students' cognitive aspect in both experiment and controlling class

Criteria	Class	
	Experiment	Control
Number of students	23	26
Mean	85	75,19
Highest score	95	85
Lowest score	70	65
Passed	20	17
Failed	3	9
Classical pass	86,96%	65,38%

Based on the data in Table 1, it is known that classical learning pass in the experimental class and controlling class is different. The experimental class has a classical pass which achieved score  $\geq 75$  by 86,96%, while the control class was 65,38%. The analysis of students' learning result showed that students following the guided-inquiry learning with JAS approach gained better result.

The difference of the mean of learning result between experiment and control class could be identified by applying t-test on the posttest result in each class after being given a treatment by applying the guided-inquiry learning with JAS approach. Before conducting the t-test, a normality test was initially conducted. The result of the normality test showed normal-distributed data i.e  $t_{count}$  in

the experimental class  $0.180 > 0.05$ , while for the control class,  $t_{\text{count}} = 0.160 > 0.05$ . After the identification result that both classes were normally distributed, a t-test was able to be undertaken. The analysis result of t-test on posttest score is shown in the following Table 2.

**Table 2** The calculation result of t-test on posttest score

Group	N	Mean	Sig.	Note
Experiment	23	85,0000	0,000	Sig<0,05 There is a significant difference
Control	26	75,1923		

Based on Table 2, it can be inferred that  $t_{\text{count}} = 0.000 < 0.005$  so  $H_a$  was accepted. It means that there was a significant difference between the experimental class and control class. Further, to find out the improvement of students' learning result, N-Gain test was conducted. The result of N-Gain test is shown in the following Table 3.

**Table 3** N-gain calculation result

Class	N	Categories of N-Gain		
		High	Medium	Low
X MIA 1 (Experiment)	23	6	12	5
X MIA 4 (Control)	26	0	2	24

Based on the data of Table 3, it is known that students who accomplished medium up to high levels were found out more in the experimental class than those of control class. This supports a statement that learning result of the experimental class was higher than the control class.

Based on the research result, the guided-inquiry learning with JAS approach on the subject material environmental pollution is effective enough to enhance students' learning result. This is proved by the optimal learning result achieved by experimental class. This learning model provides students with concrete or real learning experience. Students are able to explore the learning objects and create certain learning community so the great learning result is highly expected to accomplish. This is in line with Parlo and Butler (2007) that the learning concept which relates to the natural environment can ease students to understand the material. The learning result of experimental class achieved classical score i.e 86.98%. this research result is strongly supported by the research conducted by Wahyuni et al. (2016) that the application of guided-inquiry learning can improve students' learning pass.

The analysis result still showed several students who had not accomplish the minimum passing criteria, particularly in the experimental class despite being given a treatment. Students possess different abilities. Although the same treatment i.e guided-inquiry learning with JAS approach was applied in the experimental class, not all of the students could accept and internalize the subject materials well. The factor of students' response in following the learning process also influenced on students' learning pass because the learning success is not only observed from the learning result but also the students' response during the teaching-learning process. students who failed to achieve the minimum passing criteria gave worse response than those who successfully accomplished the minimum passing criteria. this showed us that some of the students were not quite interested in following the guided-inquiry learning with a jas approach for the subject material environmental pollution. Aunurrahman (2009) states that students with high learning motivation frequently seem seriously engaged with the learning process by actively providing questions, give opinions and the like. the assessment result of students' activity who had not achieve the minimum passing criteria gained a lower score than other students. In accordance with Faris (2017), fear activities give impact to low cognitive score.

The result of t-test showed that there was a significant difference between the mean of learning result from experimental and control class. This was caused by the different treatment given to both classes; experimental class with guided-inquiry learning with JAS approach while the control class with conventional learning model. Beside the improvement of students' learning result, N-Gain score in the experimental class was higher than the control class gained.

Based on the calculation of N-gain, the enhancement of students' understanding in experimental class was by 0.54 while 17 students were in medium up to high-level score which means that their scores are high or good. The improvement of learning result means in the control class was by 0.14 with two students were in medium up to high-level score. Based on this data, the guided-inquiry learning with JAS approach is effectively influencing the learning result for the subject material environmental pollution. This is strongly supported by Wahyuni et al. (2016) that the inquiry learning model can improve N-gain score in the class experiment more than control class which still applied the conventional learning model. The improvement of students' understanding in experimental class which is higher than the control class was caused by several factors, two of which were the fun learning atmosphere done in the open space and the direct observation to the real or concrete object done by students. During the ongoing learning and discussion, students seem very enthusiastic. Learning with an appropriate and attractive learning model supported by real learning source will make students easier to internalize the content of learning material.

Besides experiencing the improvement on cognitive aspects, experiment class students got a very good score on affective and psychometric aspects while control class students gained a good score on both aspects. The data of students' affective aspect is shown in table 4 below.

**Table 4** The cumulative result of students' affective assessment for experimental and control class

No	Observed aspects	Scores (%)	
		Experiment	Control
Discipline			
1.	Time	100	97,44
2.	Performance	100	91,03
3.	Rules	100	83,33
Students' learning motivation			
4.	Students' attention	92,75	67,95
5.	Students' interest	91,30	71,79
6.	Students' engagement	81,16	74,39
<b>Average of each aspect</b>		94,69	79,70

Students of the experimental class were very disciplined mainly in submitting the assignment. This result showed that students were very enthusiastic in following guided-inquiry learning with JAS approach on subject material environmental pollution. Setiowati et al. (2015) state that the application of guided-inquiry learning increases students' discipline and affects their learning result. Discipline in learning will sharpen students' skill and memorizing power to the previous materials because students want to study based on their awareness. In this case, students are highly motivated to study so that they will get easy to do the test by answering questions from given materials. It is proved that discipline has a powerful relationship with learning result. It means that there is an important rule in gaining excellent learning result such as doing the assignment well or on time (Aslianda et al., 2017). This is also stated by Slameto (2010) that discipline in learning is one of the factors affecting the learning result. It can be seen from the students' motivation in experimental class which gain a higher score than the control class did. motivation or interest is an essential factor in the student's learning activity. A learning activity done with no interest coming out from the students will probably give a negative impact on students' learning result (Susanto, 2013). In line with this, Ekawati

(2014) declares that learning motivation or interest gives such effects to students' learning result. Learning with high motivation will boost students to study better. This motivation emerges if students are interested in learning something because of their need or meaningful materials they have to learn more (Hamalik, 2013).

Data on students' psychometric aspect from the experimental class showed very good result while the control class showed good result. The data of students' psychometric aspect is shown in the following table 5.

**Table 5** The cumulative result of students' affective psychometric for experiment and control class

No	Observed aspects	Scores (%)	
		Experiments	Control
Performance skill			
1.	Work procedure	94,20	85,90
2.	Solving problem	88,41	80,77
3.	Communication	85,51	67,95
<b>Average of each aspect</b>		89,86	78,21

The result of the experimental class was higher than the control class. Ambarsari et al. (2013) state that guided-inquiry learning gives a significant effect on students' skill. This improvement is affected by social interaction and students' active engagement. These two influencing factors play huge roles in psychology readiness and students' appreciating behavior so these give impact to cognitive intelligence i.e an ability to accept or internalize materials, remember and solve the problem relating to the learn subject (Wilke, 2003).

In the experimental class, the aspect of performance skill implying the highest score is work procedure because most of the students have understood the work or performance they should do. The lowest score is communication. Students presented their discussion result in a good way in front of the class. However, there were some students who got difficulties in presenting their discussion result and only read their note. This is because students uncommonly speak up in front of the public.

The result of questionnaires spread out to the students showed that guided-inquiry learning with JAS approach, according to the students, gave more impact for them to train themselves to cooperate in a group work. The learning activities get students to work in a team to do observation in the environment around the school and share opinion to find out the answer to a problem. The lowest score of students' response was preparing materials before the class started. This was done because they did not know what they would learn because, in the previous meeting, the teacher only told them to preview the material of environmental pollution and prepare for a pretest. Therefore, several students usually did not do the preview the materials they will learn. Despite the low score in the point of preparing materials, some students agreed with the statement. This was because not all students can accept the learning materials they do not use to do outside the class. Some students also do not focus on following the learning process.

The teachers also give an opinion that inquiry learning with JAS approach gave impact to students' activity. This is in line with Bilgin (2009) that learning model based on the investigation has a positive impact in building attitude, improve students and teachers' creativity. In spite of many strengths of guided-inquiry learning with JAS approach, there are also some weaknesses of that model in its application to the environmental pollution material. This kind of learning requires strict preparation in order to save time. Another difficulty is that this learning model gets students always be the focus during the learning process since it is conducted outside the classroom.

The result of students' cognitive learning relates to students' activities i.e addictive and psychometric aspects. This is in accordance with Anggraini (2015) that there is a relation between the learning result of students' cognitive, affective and psychometrics . In the research result, students who

gain high cognitive score also get a high score in affective and psychometric aspect, and otherwise. Further, the students' response is also good. according to Marbon and Situmorang (2014), students' learning result tend to be high if they are active during the learning process.

## CONCLUSION

Based on the result of analysis and discussion in advance, it can be inferred that guided-inquiry learning with JAS approach effectively affects the students' learning result on subject material environmental pollution.

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