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The Influence of Guided Inquiry Student Worksheet on Learning Outcomes and Science Process Skill on the Static Fluid Topic

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Abstract

The purpose of this research is to know the influence of guided inquiry student worksheet on learning outcomes and describe learning outcomes and science process skill after using guided inquiry student worksheet. This research method was true experiment, with a sample grade of VIII H as a control class and VIII J as an experimental class, determined by purposive sampling technique. The study design used pretest-postest control group design. The data had been tested by using N-gain analysis, normality test, homogeneity test, and independent t-test. The results showed a significant effect of the use of guided inquiry student worksheet to the results of student learning outcomes. The average learning outcomes in cognitive domain of 85.24 and the improved learning outcomes with N-gain 0.81.

Keywords: guided inquiry, learning outcomes, science process skill, student worksheet

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Introduction

Science is the study of nature and its contents that can be formulated truth empirically. Science contains systematical arranged natural phenomena based on experimental results and observations by humans. In essence science is natural phenomena in the form of facts, concepts, principles and laws that are tested truth and through scientific methods. Students learn through active learning so that students can find concepts and principles for themselves. In other words, students must be active in using their mental processes in learning, so they get the experience directly to discover the concept or principle. Mental processes that consist of observing, questioning and define problems, formulate hypotheses, design and conduct experiments, analyse data, make the inferences, and present the results.

Science lesson in schools should a teacher not use conventional learning methods, where the learning is teacher centered, so students become passive and rarely respond to explanations or problems posed by teacher. Science learning is still focused on understanding the concept of students. Students are rarely trained to solve problems. Students just listen, write, and memorise what the teacher has instructed. So, students become less active in constructing knowledge. Learning becomes less meaningful and only short-term memory because students are less familiar with inquiry activities. In the learning process the students are not given the opportunity to practice their science process skills. During the learning process the students just listen and receive knowledge from the teacher without directly involved in the thinking process to obtain knowledge, so that the students' learning outcomes become low and the knowledge received by the students is does not last long and meaningless.

This is as presented by Rusmiyati and Yulianto (2009) that the activities of students who use the overall sense of learning will improve the reinforcement of memories and attitude changes so that learning outcomes are more durable [1]. Meaningful learning will not be realised just by listening or reading other people's experiences. Experiencing alone is the key to meaningfulness [2].

Guided inquiry learning is applied so that students are free to develop the concepts they are learning not only the material that is recorded and then memorised [3]. In addition, the guided inquiry model can enhance the understanding of concepts and motivation of learning because students are active in conducting investigations. This investigation has a learning stage that can be used to train the science process [4].

Matthew and Kenneth (2013) research shows the implementation of guided inquiry model can improve student learning outcomes [5]. This is because the guided inquiry learning model provides direct experience to the students as well as involves students' activities to find their own concepts with good learning experience, students can understand the concept well. In addition, students can have a stronger memory in understanding the concept so that it can solve problems and provide better learning outcomes.

Therefore, efforts need to improve learning outcomes and to-skill process science. One of them is implementing guided inquiry based student worksheet. Student worksheet is used to improve learning outcomes and students' science process skills. The material applied is static fluid because it uses experimental method on its application to find answers or solve problems with questions or problem formulations. In addition, this material is the material content in the 2015 curriculum in class VIII even semester.

This product has been developed by testing the learning outcomes in the cognitive domain. Therefore, research is conducted to determine the effect of using guided inquiry based student worksheet on learning outcomes and science process skills on static fluid topic.

Methods

The population in this study is all students of class VIII SMP Negeri 21 Bandar Lampung even semester of the 2015/2016 school year consisting of ten classes. The sample in this research is class VIII H as control class and VIII J as experiment class. Sampling of both classes using purposive sampling technique. The control class and experiment class are given pretest to measure students' early abilities. In the experimental class treatment using student worksheet based on inquiry is guided while the control class using student worksheet is commonly used in schools. After the two classes are given different treatment, the two classes are given posttest in the form of the same problem with the test at the beginning of learning activities to measure the learning outcomes achieved by students.

Science process skill assessment uses an observation sheet. Cognitive appraisal is done by pretest and posttest to measure difference of learning result of student at beginning and end of learning, measure difference of result of student learning of control class and experiment class, so research design used is true experimental pretest-postest control group design. Analysis of learning outcomes on cognitive aspects using normality, homogeneity, and different test to know statistically the presence or absence of differences and the influence of learning outcomes in the cognitive domain. The data to be tested for normality, homogeneity and difference is the value of student learning outcomes in the cognitive domain of the control class and the experiment class.

Results and Discussion

This research was conducted on 13 to 18 May 2016 at SMP Negeri 21 Bandar Lampung. The learning process lasted for 3 times lesson for class VIII H as a control class that apply learning using student worksheet which is commonly used in school and 3 times lesson for class VIII J as experiment class that apply learning using student worksheet guided inquiry based. Test of validity and reliability previous to conducting the research proceeds of N-Gain, normality test, homogeneity test, and different test can be seen in Table 1, Table 2, Table 3, and Table 4 respectively.

The result of N-Gain value is shown in Table 1. Based on Table 1, the experiment class is higher than the control class using student worksheet commonly used in the school. In the experiment class and control class obtained normal distributed data, where the sig. value is more than 0.05 that is 0.086 and 0.200.

The result of normality test of student learning result data is shown as Table 2. Based on Table 2, it can be seen that the sig. value greater than 0.05. So, the data can be concluded that the assessment of the learning outcomes of the cognitive domain is normally distributed.

The result of homogeneity test of student learning result data is shown as Table 3. Based on Table 3, it can be seen that sig. greater than 0.05. So, the data can be concluded that the assessment of the learning outcomes of the cognitive domain has the same variant. Then proceed with a different test to find out statistically about the presence or absence

of differences and the influence of learning outcomes in the cognitive domain.

Table 1: N-Gain results.

Class	Pretest	Posttest	N-Gain	Criteria
Cont.	38.10	73.09	0.554	Medium
Exp.	23.57	85.24	0.809	High

Table 2: Normality test.

Class	Sig.	Normal	Abnormal
Cont.	0.200	√	–
Exp.	0.200	√	–

Table 3: Homogeneity test.

Aspect	Sig.	Homo-geneous	Not homo-geneous
Cognitive	0.4721	√	–

Table 4: Different test.

Aspect	Differ-ent test	Sig.	Dif-ferent	Non dif-ferent
Cognitive	*t*-test	0.0	√	–

Table 5: Maximum, minimum, and mean value.

Class	N	Max. value	Min. value	Mean value
Control	28	93.33	53.33	73.09
Experiment	28	100	66.67	85.24

Table 6: Maximum, minimum, and mean value of science process skills.

Class	N	Max. value	Min. value	Mean value
Control	28	16	10	12.78
Experiment	28	20	13	16.28

The different test results can be seen as in Table 4. Based on Table 4, data on learning outcomes in the cognitive domain using student worksheet based inquiry with guided student worksheet commonly used in schools have a difference or indirectly there is the influence of user-based student worksheet based inquiry on learning outcomes and the skillful processes of science.

The maximum values, minimum values, and the mean values in the cognitive domain in the control class and the experiment class can be seen as in Table 5. Based on Table 5, the cognitive learning field shows that the experiment class is larger than the control class, cognitive learning of students who apply learning using guided inquiry based student worksheet is higher than with student worksheet which is commonly used in school.

In addition, students' experiment science classroom skills are larger than control class, so that the average value of science process skills that apply learning using inquiry based student worksheet is guided higher than the student worksheet commonly used in schools.

The maximum values, the minimum values, and the mean values in the cognitive domain in the control class and the experimental class can be seen as in Table 6. Based on Table 6, the science process shows that the experiment class is larger than the control class.

The qualitative distribution of the cognitive aspects of the control class and the experiment class can be seen in Figure 1. Based on Figure 1, the percentage of students who get Very Good criteria in the experiment class is 78.5% more than the percentage of students in the control class which is only 21.5%. As for the criteria Good percentage of students more in the control class by 53.5%.

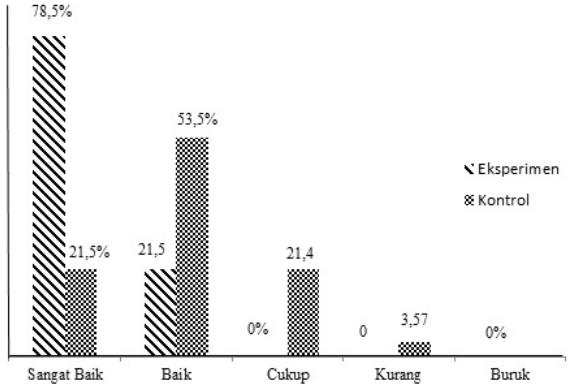

Figure 1: Graph of distribution of cognitive aspects of control class and experiment class.

Compared to the percentage of students in the experiment class of only 21.5%. This suggests that students in the experiment class are superior in terms of cognitive assessment than students in the control class. The qualitative representation of students' learning outcomes on the cognitive aspects based on predicate learning outcomes of students and the qualitative distribution of the skills of the control class science process and the experimental class can be seen in Figure 2.

Based on Figure 2, the percentage of students who received the quality letters A, and B, more in the experimental class is 32.1% and 67.9%. Students who obtained Predicate B and C more in con-

trol class, that is 82,14%, 10,71%. This suggests that students in the experiment class are superior in terms of cognitive assessment than students in the control class.

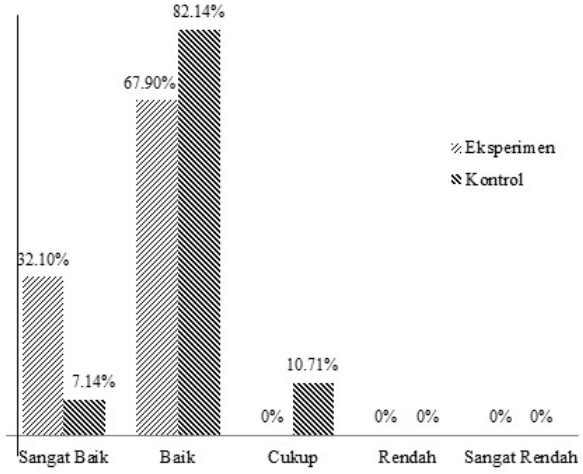

Figure 2: Graph of distribution of value of process control skills of control class and experiment class.

Summary

Based on the data analysis in Table 5, it is found that there is an increase in average learning outcomes using student worksheet based inquiry on higher level compared to using conventional student worksheet, where based on data Table 5 shows that both the experiment and control class are equal, similarly increased learning outcomes. However, the increase in the experiment class is higher than the control class. Percentage of N-Gain in the class of 0.809 with medium high criteria in grade 0.554 with medium criteria. This means that treatment using student worksheet has significant effect on learning outcomes. Students in the experiment class find it easier to understand the concept of static fluid than the students in the control class.

The increase in the experiment class is due to the advantages possessed by the student worksheet based on the guided inquiry it self. The guided inquiry-based student worksheet contains the static fluid topic that is discussed in more detail. In the preparation of student worksheet is based guided inquiry model consisting of observation, problem formulation, preparing hypothesis, collecting data covering, tools and materials, experiment procedures, data tables, analysing data, and concluding, then in the student worksheet also contains the provision of trial procedur to guided inquiry, which directs students to find or apply their own ideas but still in teacher guidance as well as static fluid matter concepts in everyday life are packed attractively through images of phenomena and experiment activities. Physical phenomena written clearly presented and easily understood by students. They are led in understanding the concept of static fluids step by step from beginning to know the phenomena to conclusions about this topic. All are arranged in accordance with the learning steps that exist in the Curriculum 2013 are observing, questioning, trying, associating, and communicating.

The second advantage in terms of design. The guided inquiry-based student worksheet that the researcher uses have a more appealing look compared to the conventional student worksheet. From the presentation of drawings, writing, color, student worksheet is much better appearance than the conventional student worksheet.

In this study it is known that the use of this guided inquiry-based student worksheet can effectively affect the students' cognitive learning outcomes. This can be seen from the data of student learning outcomes in the experimental class that overall get the value with a large percentage, i.e. 85%. Another research that supports the research results Febrizha (2015), namely student worksheet inquiry guided on the subject matter of fluid static can improve student learning outcomes of students 77.78% [6].

Relevant research is also conducted by Purnamasari (2014) stated that by using the guided inquiry model guided by student worksheet can improve student learning outcomes [7]. Based on the results of research that has been done, it can be seen that this guided inquiry-based student worksheet can improve student learning outcomes, because in the student worksheet is equipped with questions analysis questions, experiment procedure, and illustration images phenomena related fluid static topic on each student worksheet activities that help students in discovering the concept itself so that learning is more meaningful and absorbed into the longterm of student memory.

The science process skills assessment is obtained from the student process data during the learning using a science process skills assessment sheet with indicators established through direct observation. In the classroom is done by observation by the teacher assisted by the observer through the science process skills assessment sheet.

According to Dale (1969), in the classification of learning experiences poured into his cone of experience, suggests that the best learning is to learn from hands-on experience [8]. Direct experience is an experience that students gain as a result of their own activities. Students deal directly with the object to be studied. Because of this direct experience, there is a tendency of the results obtained by students to be concrete so that it will have high determination.

In addition, based on the research of Marchasari, *et al.* (2012) stated that guided inquiry learning affects the students' cognitive learning outcomes with

a significance value of 0.000 [9]. In Hilman's (2014) study, it was found that inquiry learning guided by mind map provides a significant positive effect on science process skills and science learning outcomes [10]. Learning using guided inquiry-based student worksheet gives students the opportunity to explore skills in the field of science, especially on process skills, students are required to follow a process, observe objects, interact actively, and students can experience themselves and seek the truth they experienced in the process learning. So that the student's skill in developing, especially in the student's science process skills, because all components of this learning-oriented process of learning. In the process students are immediately introduced to the original tools and materials. Almost all students active in learn, either in preparing the tool, installing the practicum installation, taking measurements and observations, subsequently writing down the results of the lab, make conclusions. Teachers present learning by using guided inquiry-based student worksheet, it improves student's science process skills effectively.

Conclusion

Based on the results of the research and summary that has been done, the conclusion is obtained as follows. It can be a significant influence of learning using student worksheet based on guided inquiry of learning outcomes with high category N-Gain. The use of this guided inquiry-based student worksheet can improve learning outcomes and the skills of the science process. The average acquisition of learning outcomes is 85.24. In the skill of science process in using student worksheet based on inquiry is guided with the average of 16.28.

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