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THE EFFECTIVENESS OF THE APPLICATION OF SCIENTIFIC LITERACY-BASED NATURAL SCIENCE TEACHING SET TOWARD THE STUDENTS' LEARNING ACTIVITIES AND OUTCOMES ON THE TOPIC OF THE INTERACTION OF LIVING ORGANISM AND ENVIRONMENT

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ABSTRACT

This research was aimed to find out effectiveness of the application of scientific literacy-based natural science teaching set toward the students' learning activities and outcomes on the topic of The Interaction of Living Organism and Environment. This study is a quasi-experimental study of non-equivalent type (pretest-posttest). The results showed that the teaching set was effective, as proved by the t-test of the learning outcomes of the experimental group (t4,78> t1,66) which was different to the control group (thitung>t1,66), the results of the experiment group n gain average was 0,55 and the control group was 0,39 which was in the average category. The t-test value of the activities in the experimental group (t3,52>t1,66) was different to the control group (thitung>t1,66). Based on the analysis results, it could be concluded that the application of the scientific literacy-based natural science teaching set was effective toward the students' learning activities and outcomes.

Keywords: Environment; interaction of living organism; natural science teaching set; scientific literacy

INTRODUCTION

Implementation of science learning requires appropriate model and learning set. Appropriate learning set makes students acquire whole knowledge and skills so learning process can be a meaningful activity for students. Meaningfulness of science learning for students can be obtained if the students have good scientific literacy ability. Students' scientific literacy ability is directed by teaching them using scientific literacy-based learning set.

Scientific literacy is scientific knowledge and understanding of the relationship of science, technology, society and environment (Yuenyong & Narjaikaew, 2009). That understanding shows that scientific literacy abilities are related of all science aspects, so that it will better to prepare students to have the science skill and understanding ability in the context of personal, local, and global. Holbrook & Rannikmae (2009) states that scientific literacy skills develop science skill and ability dealing with everyday life, solve problems and responsible for the decisions taken creatively.

Based on the results of PISA study, scientific literacy in Indonesia is still relatively low. The low learning achievement and scientific literacy in Indonesia are due to several things for example learning activity focuses on the teacher (teacher centered), positive attitude of students in studying science is low, there are some unfavorable basic competencies related to the content, process, and context taken based on the respondents (students) response (Sumartati, 2010). West (2010) explains that the ideal condition of science learning activity should make students are free to think, work and find a way to solve the problem of education without being burdened by the un-

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derstanding barriers.

Based on observation result from SMP Negeri 1 Pemalang grade VII, it shows that the instructional material of topic of The Interaction of Living Organism and Environment used textbook that presented theories with less attractive presentation, consisted of few activities involving students actively, and is not based on science literacy then it made students were not able to connect science concept that they have learned to solve everyday life problems. Students are not encouraged to practice of because the reason of lack of time so that the curriculum target was not achieved.

Hanrahan (2009) explains that basic literacy, language skills, and learning system have important role in science learning. One of components of learning system that plays the important role in helping students to achieve standard competency is learning resources especially instructional material. Then, it should not focus only on cognitive knowledge achievement area, but also involve other aspects such as thinking, science literacy, training students on life skills and as directing students to associate the learnt subject and everyday life problem, so they can get benefit from the subject. Sudiatmika (2010) describes in his dissertation that science teaching should emphasize scientific literacy as the provision of life skills.

Based on the previous discussion, this research is aimed to find out effectiveness of the application of scientific literacy-based natural science teaching set toward the students' learning activities and outcomes on the topic of the interaction of living organism and environment.

METHOD

The research was conducted in SMP N 1 Pemalang even semester academic year 2013/2014. The population in this study was all students of grade VII consisting of 8 classes. While, the samples consisting of two classes of VII H consisting of 42 students as experiment group and VII B consisting of 40 students as control group were taken by purposive sampling technique. This research used quasi experiment design with non-equivalent types (pretest-posttest).

Source of data in this study was students and teachers of SMP N 1 Pemalang. The quantitative data were students; learning outcomes and activity during the learning process. Students' learning outcomes or score was then used to analyze the effectiveness of the science teaching set of topic of The Interaction of Living Organism and Environment. The effectiveness of science teaching set was observed from the results of students' learning outcomes and activities t-test.

Students' attitude towards science was analyzed by using questionnaire. The type of questionnaire used was closed-ended questionnaire that provided complete answer choices, so the respondents should mark on the selected answer (Arikunto, 2006). Based on the PISA 2006 there were 9 sub aspects of attitudes, but in this study, it only focused to analyze 7 of them adjusted to students' ability of grade VII in topic of The Interaction of Living Organism and Environment.

RESULT AND DISCUSSION

Average score of students' activity in experiment and control group can be seen in Figure 1.

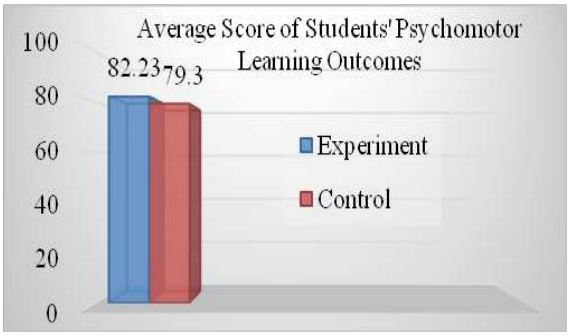

Figure 1. Chart of Average Score of Students' Activity in Experiment and Control Group

Based on Figure 1, it can be seen that the average score of the experiment group activity was higher than control group. Through science learning topics in topic of Living Organism and Environment Interaction based on scientific literacy, students were active in doing observation, experiment, group discussion and class discussion. In experiment group, activity was assessed by using observation sheet of skill assessment, there were four observers and each observer observed two groups. Based on the results of the data analysis of students' activity, it was found out that during the learning process students' activity showed good results.

Science learning process in this study used instructional materials assisted by audio-visual media of video related to The Interaction of Living Organism and Environment topic that can encourage students' learning motivation. Bravo et al (2011) in his research stated that the use of video as educational media has a positive effect in helping students to improve their learning motivation.

Science learning activity in topic of The

Interaction of Living Organism and Environment based on scientific literacy was able to optimize students' activity because it provides opportunity for students to be actively involved in every activity, students' activeness data were obtained from students' activity while observing the environment, doing experiment, and performing discussion grous. According to Dalyono (2007) students' strong motivation can encourage them to do all learning activities seriously and passionately.

The average of gain index of experiment group is 0.55 while control group is 0.39, they are in the Average criteria. The average of gain index of experiment and control group is presented in Figure 2.

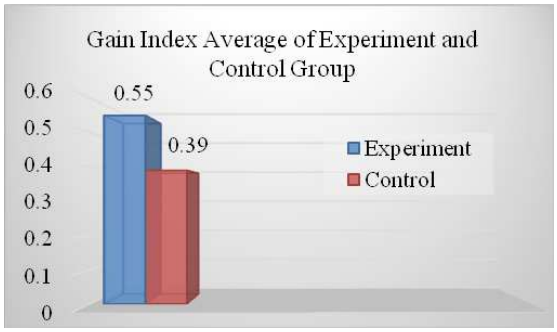

Figure 2. Chart of Gain Index Average of Experiment and Control Group

The differences of n-gain average of experiment and control groups showed that the science scientific literacy-based learning set can access students' ability in aspects of scientific literacy. The learning outcomes or post test of experiment and control groups was taken through the field implementation. Scientific literacy-based learning set was implemented in experiment group, where it can be seen in Figure 3 that students' learning outcomes in experiment class was higher than control group.

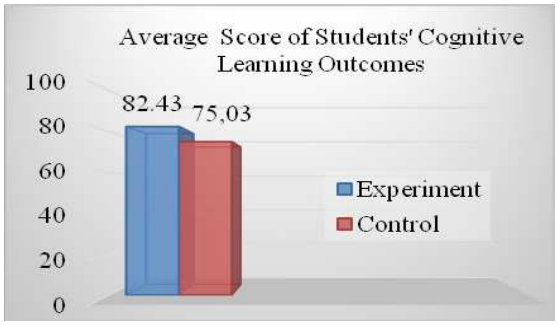

Figure 3. Chart of Average Score of Students' Cognitive Learning Outcomes in Experiment and Control Group

Figure 3 shows that the average learning outcomes of experiment group is higher than control group. The success of scientific literacy-based learning set is supported by Haristy, Ernawaty and Lestari (2012) opinion that state that scientific literacy-based learning can improve learning outcomes, activities, motivation and critical and curious attitude of students.

Scientific literacy-based learning set can make students to be more active so they can improve their learning outcomes. The use of instructional materials based on scientific literacy can improve students' learning interest, students are interested and comfortable to learn by using that instructional material. The students' interest of learning activity affect on the level of students' material understanding. Khamidah, Fatmaryanti, and Akhdinirwanto (2013) states that the interest and enthusiasm of students in learning activity can improve their material understanding that will result in improving their learning outcomes.

Students' achievement reached Minimum Completeness Criteria (MCC) (≥75), it was supported of the cognitive process of learning step on the scientific literacy-based learning. Learning activities consisted of exploring activities of environmental observation around SMP Negeri 1 Pemalang. Students explored, construct understanding through initial activities designed by teacher to raise students' interest. Students did direct observation by observing the surrounding environment that supports students to compare between theory and fact. According to Clements (2004) outdoor learning provides concept understanding and trains students' children. Skills that are trained are science process skills, communication, and environmentally responsible.

The average of learning outcomes and next was analyzed by using t test to analyze the effectiveness of science learning set application. The result of t-test of learning outcomes and activities in experiment and control group is presented in Table 1.

Table 1. T test of Learning Outcomes and Activity Score

Variation	Learning Outcomes		Activity	
	Exp	Con	Exp	Con
N	42	40	42	40
Mean	80,24	69,35	82,23	79,30
SD	9,59	10,99	4,79	2,22
t_{value}	4,78		3,52	
t_{table}	1,66		1,66	
Note	Different		Different	

Table 1 shows that at level of 5% learning outcomes tvalue = 4.78 and activity tvalue = 3,77 while t table = 1.66, because the price t value> t table then Ho is rejected. It means that there is a difference between the average of learning outcomes and activity score of experiment and control groups, or statistically the average of experiment group is higher than control group. It can be said that science teaching set is effective if the t test of learning outcomes and activity score of experiment and control group shows the differences.

Students' affective assessment of experiments group was assessed by using attitude questionnaire filled by the students by giving a checklist (√), meanwhile in control group it usead affective assessment sheet from teacher. Attitude questionnaire used in the experiment group was modified based on PISA 2006 that indicates the students' interest in science, for example loving scientific inquiry, being motivated to be responsible, for example, to preserve natural resources and environment. Students' affective learning outcomes average experimental class and control class there is no difference. The average of affective student learning outcomes in experiment group showed a positive response.

The students' attitude in showing their curiosity of science and its issues obtained positive response of very interested (VI) and interested (I) of 98.1% and a negative response of less interested (LI) of 1.9% . High positive response is due to the statement that is used to analyze the students' attitude to raise the daily problems faced by them.

The students' attitude in showing a willingness to acquire additional scientific knowledge and the ability to use learning resources and methods obtained positive response of 97.1% and negative response of 2.9%, almost every student gave positive response. This is caused by the simplicity to access information.

Current technology developments facilitate student to learn by using many resources. Students mostly proved their high interest of learning by searching for subject materials from the internet.

The application of science learning topic of The Interaction of Living Organism and Environment scientific literacy-based was able to create good atmosphere in the learning process (enjoyable learning), for example, students were excited in learning outside the class by observing surrounding environment for example rice field and river. Through the application of this learning, students can feel, dialogue, not only just memorize. Students were attracted to join the learning process and motivated to learn. Based on brief interview to students, they felt motivated to study harder, because students can understand the topic of topic of The Interaction of Living Organism and Environment through direct and indirect observation during learning activities.

Students' attitude in supporting the use of factual information and explanations obtained positive response of 96.4% and negative response of 3.3%. The percentage of positive responses was higher because the learning context was about daily life and global warming effect.

Students' attitude in defining careful logical and process needs of inferring got positive response of 96,7% and negative response of 3,3%. Students were interested to learn the material because of the material is representative of daily life phenomena, for example global warming topic. They often hear about it but cannot figure out its process. Students were interested in listening and watching video media given by teacher excitedly.

High response was also obtained in aspect of supporting science inquiry of 96,6%. It happens because students are instructed to do experiment for example the effect of detergents of fish life. This activity is aimed to determine the effect of air pollution caused by human in everyday life. Students also made organic fertilizer from goat poop in order they are trained to process organic waste to be fertilizer.

Hodson in Al-Naqbi (2005) stated that the role of experiment in science learning is to develop scientific work ability by doing science process series. The ability of scientific work can develop students' creativity in solving problems involving science in daily life. Adisendjaja (2008) stated that experiment is one of media to develop science process skill

so they can be more concerned to scientific phenomena occurred in their environment.

Students' attitude in showing personal responsibility to preserve the environment obtained positive response of 93,9% and negative response of 6,2%. Students' responsibility to maintain their environment can be observed from their activity of keeping the sanitation of school environment by providing garbage trash in every school corner and grouping the trash based on its type.

Meanwhile students' attitude in showing their concern of environmental damage caused by human act obtained positive response of 95,6% and negative response 4,3%. Then students' attitude in showing their willingness to maintain natural resources obtained positive response of 96,9% and negative response 2,9%. Most of students gave positive response of being responsible of natural resource and environment attitude. This can be seen from learning activity when students were interested to find out the effect of environmental pollution, like soil, water and air pollution for life. They were interested because they have major concern to environment problem and feel responsible to preserve the natural resources.

CONCLUSION

Based on the analysis, it can be concluded that the application scientific literacy-based natural science teaching set on the topic of The Interaction of Living Organism and Environment consisting of lesson plan, instructional material, students' worksheet and evaluation test is effective to improve students' activeness and learning outcomes.

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