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THE EFFECT OF MODULE-BASED BOUNDED INQUIRY LABORATORY ON THE DIGESTIVE SYSTEM MATERIAL OF XI GRADE TOWARD PROCESS DIMENSION OF STUDENTS' SCIENCE LITERACY.

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Abstract: The purpose of this study is find out the effect of module-based bounded inquiry laboratory on the digestive system material of XI grade toward process dimension of students' science literacy. This study was quasi experimental research used the one group pretest-posttest design. The population of this study was all students of 7th State Senior High School Surakarta. The sample was taken using 28 students in XI grade of science class first. The data was collected through test and non-test techniques. Data analyzed by using normalized N-gain and Wilcoxon test. The result of study showed module-based bounded inquiry laboratory on the digestive system material of XI grade was influenced toward process dimension of students' science literacy by Wilcoxon test evidenced p < 0,05, Ho are ignored. Therefore, it is significant difference of the result before (44,22) and after (83,51) the using module. Based on the results of the study can be concluded that there is significant effect of module-based bounded inquiry laboratory on the digestive system material of XI grade toward process dimension of students' science literacy.

Keywords: *Module-Based Bounded Inquiry Laboratory, Process Dimension Of Students' Science Literacy, Digestive System Material.*

1. INTRODUCTION

Sumartati (2009) stated that the process of science can form a scientific attitude, science and technology literacy overall. Science learning is intended to build the students' science literacy so that they can apply their knowledge in daily life and make a decision (Adisendjaja, 2007). It is relevant to Liliasari statement (2011) that education should be directed to produce learners who are literate in science (scientific literacy), in order to solve the problem of global era that is complex and diverse. Science is a strategic vehicle to increase values, attitudes, and thinking abilities, so that students are able to solve the problems (Osman , et al., 2007). Scientific literacy is defined as the abilities to apply scientific knowledge and skills through the inquiry process, not only to understand of the living things but able to make decisions and changes made through natural activities (OECD cit. Toharudin, et al., 2011). Scientific literacy includes three aspects include the measurement of the content of sciences, the process of sciences, and the context of science (PISA, 2012) .

Factually, learning science (especially biology) tend to be textual and transfer of knowledge. As an impact the learning tend to be oriented to the product than process and attitude development. Learning tends to be less to train science process skills that are the characteristic of biology learning. Indicators of students' science process skills was low can be seen from the results of the PISA test in which the students' scientific literacy achievement of Indonesia from 2000 to 2012 showed decreased (Center for Research and Education Assessment Kemdikbud , 2011) . This is supported by results of science literacy test were adapted from PISA questions (2006) showed that the students' scientific literacy achievement lowest obtained in the process dimension of scientific literacy (10.92 %). The low of students' scientific literacy achievement predicted that related with of learning process that is still teacher centered. As a result, students tend to be passive, so that students learn science as a product rather than as a process. Teacher lack trained student to solve the problems by using students' science concept, so that students have difficulties in solving problems. It is supported

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by the results of analysis of the eight National Education Standards in 7 State Senior High School of Surakarta showed that the component of the process standard is not ideal yet (Hermita, 2013). It's mean that the students need to be empowered to consider various aspects of learning. According Widoyoko (2012) statement that the success of learning is influenced by many factors, one of the learning factors which is the learning media. The various types of print media commonly used in learning include: textbook, module, student worksheet, etc.

Module is the teaching materials which have the characteristics can be used as a learning source by students independently, because supported by the guidance activities of learning that are equipped with the independence evaluation. Module- based inquiry has several advantages including: 1) to encourage the students to find a concept through experience actively (student centered learning); 2) encourage students to perform activities by direct experience, so that trained students able to identify scientific issues, understand the scientific facts, and apply it in daily life; 3) to improve the students' scientific literacy and scientific attitudes development; 4) to improve the students' scientific literacy through investigation activity, so that students not only acquire the product of science but also the process and its application (Eren and Sedar: 2013 ; Remziye Ergul: 2011; Ketpichainarong et al.: 2010; Wenning: 2007). According to Wenning (2005) inquiry by known as the hierarchy of inquiry learning model is based on the intellectual as the controller (Wenning, 2005b). Bounded inquiry laboratory is one of the inquiry hierarchy levels of Wenning' model.

Module-based bounded inquiry laboratory is a module with stage activities include: observation, manipulation, generalization, verification, application. The excellence of bounded inquiry laboratory between the inquiry of Wenning' hierarchy is: 1) trained students to solve problems independently with pre-lab activities without much guidance from teachers through investigate ability (Wenning, 2011). Referring to the stages of its activities, the module-based bounded inquiry laboratory deemed appropriate to improve the low dimension process of scientific literacy. This is supported by the results of students' mastery of inquiry indicators test showed that in general students have been ready doing the activities as stages of the bounded inquiry laboratory model (Hermita, 2014). Hermitas' study (2015) are relevant to Wennings' study (2005b) showed that the bounded inquiry laboratory model can enhance the ability and independence of students in designing and conducting experiments with teachers and guidance relating to occupational safety in the laboratory. In addition, it is also supported by data by using interviews and observation indicate that the students have quite high motivation in practicum activity (54 %). Motivation is an important role in learning, because motivation can encourage students to learn in finding concepts independently. The use of bounded inquiry laboratory model can train students in solving the problems. The existence of safety procedures in the use of tools and laboratory materials safely, students are expected to be more careful in working in the laboratory (Johnson, 2006). In practical activities in the laboratory, need to apply scientific procedures and safety as stated in the Ministerial Regulation No. 64 in the year 2013. Therefore, through module-based bounded inquiry laboratory is expected to encourage students to find concepts independently through a process of scientific investigation with due regard to safety and security aspects of work in laboratory. Under these conditions it is necessary to investigate the effect of module-based bounded inquiry laboratory toward process dimension of students' scientific literacy.

2. RESEARCH METHOD

The purpose of this study is find out the effect of module-based bounded inquiry laboratory on the digestive system material of XI grade toward process dimension of students' science literacy. This study was quasi experimental research used the one group pretest-posttest design. The population of this study was all students of 7th State Senior High School Surakarta. The sample was taken using 28 students in XI grade of science class first Academic Year 2014/2015. The data was collected through test and non-test techniques. Data analyzed by using normalized N-gain and Wilcoxon test.

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3. RESEARCH RESULT

The test for normality and homogeneity of the dimensions process of students' scientific literacy presented in Table 1 .

Table 1. Results of Normality and Homogeneity Test Toward Dimension Process of Students Science Literacy Process

Test	Result	Decision	Conclusion
Normality	Sig *pretest* = 0.109	H_0 accepted	Data is normal
	Sig *posttest* = 0.047	H_0 rejected	Data is not normal
Homogeneity	Sig = 0.005	H_0 rejected	Data is not homogeneity

Data Table 1 indicate that the test for normality in the pretest was 0.109 (sig. > 0.05), the decision Ho was accepted. Mean that the data distribution was normal. Normality test at posttest was 0,047 (sig. < 0.05), the decision Ho was rejected. Mean that data distribution is not normal. The result of homogeneity test was 0.005 (show sig. < 0.05), the decision Ho was rejected. Mean that data is not homogenous. It can be concluded that the pretest was normally distributed, but the posttest was not normally distributed and all samples come from populations that are not homogeneous. Following statistical hypothesis test, continuous by using non- parametric statistic by Wilcoxon test as presented in Table 2.

Table 2. Results of the Wilcoxon Test Process Dimensions of Science Literacy

Test	Results	Decision	conclusion
Lanjut	T_{hitung} = -4.638 p = 0.000	H_0 rejected	The results are not the same (No difference)

Table 2 showed that the Wilcoxon test with probability (sig = 0.000 < 0.05), then Ho is rejected. Mean that was no difference in the value of dimension process of science literacy before and after using the module-based bounded inquiry laboratory.

Table 3. Dimensions of Science Literacy Process

Aspect	Value	
	pretest	*Postest*
Dimensions Process of Science Literacy	44,22	83,51

Table 3 showed that the value of dimension process of science literacy for posttest (83.51) higher than pretest (44.22). Mean that the value of dimension process of science literacy has increased.

4. DISCUSSION

The research results showed that module-based bounded inquiry laboratory can improve the students' process dimension of science literacy. It's relevant with study of Brickman et al. (2009) indicated that inquiry-based learning can improve students' science literacy and science process skills. Increased of the process dimension of science literacy associated with the characteristics of module-based bounded inquiry laboratory have used. Syntaxes of module-based bounded inquiry laboratory include: 1) observation; 2) manipulation; 3) generalization; 4) verification; and 5) the application Wenning (2011).

In the beginning of syntax of module-based bounded inquiry laboratory (observation), facilitating the students with a problem to be solved through a series of activities science process skills such as: identifying problems, formulating hypotheses, designing experiments with the direction of safety and safe use of laboratory equipment. So as to encourage students' thinking skills to solve problems through the discovery process and can hone students' science literacy. Similar with Piagets' learning theory, that learning is the discovery of the concept through thinking process. It is relevant to Lederman (2013) statement that the students' science literacy related with the ability and readiness of students to make a decision an issue. This is similar to the Dogru (2008) statement that learning-based problem-solving process, can improve thinking skills and science skills of students. In the second syntax of model-based bounded inquiry laboratory are focused on the students' scientific inquiry and observation activity, so that students can construct knowledge through discovery. Relevant to Bruners' learning theory that learning is a process of rediscovery of knowledge through investigation (Dahar, 2011). This is supported by research results Gucluer (2012) showed that the learning process is accompanied by scientific investigation activity, make students understand not just by knowledge but brave decision.

Science literacy is defined as the ability to process using science process skills which includes three aspects which include:

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identifying scientific questions, explaining phenomena scientifically, and use scientific evidence (Toharudin, et al., 2011). Meanwhile, according to Wenning (2007), the ability of inquiry is an overview of students' scientific literacy. Meaning that if the scientific literacy of students increased, it can be ascertained inquiry abilities of students has also increased. This is similar to the statement Edelson (2001) that based learning inquiry is the best way to achieve scientific literacy as students had the opportunity to discuss, debate scientific ideas that involves students in investigations of science, activities and skills, which focus on the search and active involvement in acquiring knowledge. In the generalization activity which constitute as the third syntax of models of bounded inquiry laboratory, students are required to collect data according to the findings. This is relevant to Minner et al. (2009) statement that through inquiry learning model encourages students conducted scientific investigation related to phenomena or contextual issues, allowing students can construct knowledge. The fourth syntax is to verify, in which students are required to evaluate the concordance between results with students' understanding of the concept. The fifth syntax is the application of the concept, students able to apply the concepts that have been understood in different situations. It is relevant to Ausubels' learning theory that learning is said to be significant if the student can associate the initial information with new information that is relevant to knowledge in cognitive structures through experience, so that students are able to construct knowledge significantly (Dahar , 2011) . In line with TRNA Et Al. (2012) which asserts that learning involves direct experience through the problems derived from daily life to motivate and inspire students to learn science. Thus the existing activity in laboratory models of bounded inquiry is closely related to the process dimension of science literacy.

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5. CONCLUSION

Based on the results of the study can be concluded that there is significant effect of module-based bounded inquiry laboratory on the digestive system material of XI grade toward process dimension of students' science literacy.

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