Differences of Bounded Inquiry Laboratory and Guided Inquiry Laboratory to Students' Cognitive Achievement

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ABSTRACT

There are many types of model including Guided inquiry laboratory and bounded inquiry laboratory that has characteristics different syntax. This study aims to determine the difference effect of bounded inquiry laboratory and guided inquiry laboratory to students' cognitive achievement. The participants were all students of XI grade XI of science class at one of high school in Sukoharjo Central Java Province, Indonesia. Two classes were purposively selected as sampling, i.e grade XI2 and XI3. The first class consists of 38 students which were 18 male, and 20 female. Bounded inquiry laboratory model was applied to the first class. The second class which consisted of 18 male students and 17 female students was treated by guided inquiry laboratory. Cognitive achievement of students was measured by test on related concepts. Data saved analyzed by t-test. The results showed that students' cognitive achievement of grade XI.2 (86,64) which was higher than grade XXI.3 (82,94) with significance level (0,429). It can be concluded there are no difference of students' cognitive achievement in both treatments.

Keywords: bounded inquiry laboratory, guided inquiry laboratory, cognitive achievement.

1 INTRODUCTION

Inquiry is the soul of science as one of the main goals of learning science, therefore. Ideally science taught by inquiry activities through science process skills includes: asking questions, forming hypotheses, design-building theories, and revising theories (Crawford, 2000). Learning uses inquiry requires students to be active in acquiring knowledge. Learning uses inquiry can create a classroom atmosphere where students actively discover knowledge through the research process as practiced by scientists. There are many types of models including guided inquiry laboratory and bounded inquiry laboratory that has characteristics different syntax. This study aims to determine the difference effect of bounded inquiry laboratory and guided inquiry laboratory to students' cognitive achievement.

The process of learning uses bounded Inquiry model students work or study individually or in groups motivated to perform each activity because they have to produce different products to put together in a working group report. Bounded inquiry model providing the freedom and opportunity to students to explore with the facts through observation or experiment so as to arouse the interest and curiosity of students to the concepts studied. Guided inquiry students are given a model of motivation in learning and teachers play leading roles in learning, Bounded Inquiry while the teacher models do not provide the motivation or the role of the teacher and students are given very little freedom in solving problems. So that the experimental study was conducted comparing the application of guided inquiry learning model with bounded inquiry learning model.

2 RESEARCH METHOD

The participants were all students of XI grade XI of science class at one of high school in Sukoharjo Central Java Province, Indonesia. Two classes were purposively selected as sampling, i.e grade XI2 and XI3. The first class consists of 38 students which were 18 male, and 20 female. Bounded inquiry laboratory model was applied to the first class. The second class which consisted of 18 male students and 17 female students was treated by guided inquiry laboratory. Cognitive achievement of students was measured by test on related concepts. Multiple-choice test of 30 questions were prepared based on the concept mastery indicator on pollution material. Data saved analyzed by t-test

3 FINDINGS AND DISCUSSION

3.1 Findings

The results of the research presented on the Table 1 and Table 2 below.

Table 1. Students' Cognitive Achievement

No	Comparison	Science Class	
		XI.2 Grade	XI.3 Grade
1	Maximum value	95,00	98,00
2	Minimum value	73,75	66,00
3	Average value	84,64	82,95
4	Standard deviation	1,01	1,11

Table 2. The Analysis of Students' Cognitive Achievement

Test	Test name	Results	Decision	Conclusion
Normality	Kolgomorov-smirnov	Sig. XI.2 grade of science class=0,243	H0 accepted	Normal
		Sig. XI.3 grade of science class=0,041	H0 rejected	Abnormal
Homogeneous	Levene's test	Sig.=0,708	H0 accepted	Homogeneous
Comparison	*Wilcoxon*	Sig.=0,905	H0 accepted	No difference

Based on data above t-test analysis of students' cognitive achievement showed there is no difference between students' cognitive achievement of XI.2 grade and XI.3 grade.

3.2 Discussion

Based on t-test showed that there are no differences of students' cognitive achievement in both treatments. This is because the two models (bounded laboratory inquiry and guided inquiry laboratory) is part of the inquiry-based learning, despite there is little difference of each syntaxes. Inquiry-based learning includes: asking questions, forming hypotheses, design-building theories, and revising theories (Crawford, 2000). Therefore t-test results showed no significant difference or with significance level (0,429). However, the average value of student achievement shows that the application of laboratory inquiry bounded (86.64) was higher than the guided inquiry laboratory (82.94). This is because their activity of pre-laboratory on the bounded inquiry laboratory model, so that students are more careful and detailed in the investigation. This step is predicted to make the students' understanding of the pollution material better, thus becoming students' achievement better. This is consistent with Kuhlthau (2007) which states that the inquiry is the basis for science learning that emphasizes the teacher to focus on inquiry and to develop students' understanding. In line with Piaget stating that there would be a true learning process if students do not act on the information mentally and assimilate or accommodate what they encounter in their daily lives (Dahar, 2011). In addition to the application of laboratory inquiry bounded students have the freedom to solve problems, while on the application of guided inquiry laboratory students are given guidance by the teacher, so that through bounded inquiry laboratory students can freely express their ideas in solving problems. This is in accordance with the NRC (1996); Driver et al. (1994); Cheng et al.(2005) and Keys and Bryan (2001) bounded inquiry laboratory model has advantages including: 1) Children learn best through active, not passive lessons; 2) Students are introduced to scientific methods and then use those methods to engage in hands-on and minds-on activities that inspire students to discover scientific knowledge, rather than being told answers by the teacher or textbook or memorizing the information for assessment given later and then for getting the information; 3) Inquiry-based curricula create opportunities for students to explore authentic scientific phenomena, participate in generating research questions, and communicate their findings with peers; 4) Through inquiry, learners experience not only the construction process of science knowledge; 5) Through inquiry, also realize that their backgrounds and beliefs influence the formation of scientific knowledge; 6) In scientific inquiry, people's problem-solving abilities, process of scientific knowledge discovery, as well as critical and logical thinking abilities are emphasized. In scientific inquiry also emphasizes discourse, communication, discussion, and argumentation. This is in contrast with the results of previous study (Marheni, 2014) that the applied of guided inquiry laboratory at the junior high school students are less successful because students still think concretely so that the difficulties in solving the problems that are abstract. In the context of this study guided inquiry laboratory applied to high school students who are able to think abstractly and has a self- learning.

4 CONCLUSION

Based on the results of study can be concluded there are no differences of students' cognitive achievement in the application of the bounded laboratory inquiry model and guided inquiry laboratory, but the average value of student achievement showed that the application of laboratory inquiry bounded (86.64) was higher than the guided inquiry laboratory (82.94).

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REFERENCES

Cheng, S., Lin, C., Chen, H., and Heh J., 2005, Learning and diagnosis of individual and class conceptual perspectives: an intelligent systems approach to using clustering techniques, *Computers and Education, v. 44, p. 257-283*.

Dahar, R. W., 2011. Teori Teori Belajar. Jakarta: Erlangga

Driver, R., Asoko, H., Leach, J., Mortimer, E. & Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher,* 23(7), 5-12.

Keys, C.W., & Bryan, L.A. 2001. Co-constructing inquiry-based science with teachers: essential research for lasting reform. *J. Research in Science Teaching, 38, 631-645.*

Kuhlthau, C.C., Maniotes, L. K., & Capsari, A. K. 2007. Guided Inquiry: Learning in the 21st Century. London: Libralies Unlimited.

Marheni, N.P., Muderawan, I W., dan Tika, I N. 2014. Studi Komparasi Model Pembelajaran Inkuiri Terbimbing dan Model Pembelajaran Inkuiri Bebas Terhadap Hasil Belajar dan Keterampilan Proses Sains Siswa Pada Pembelajaran Sains SMP. *E-jurnal Program Pascasarjana Pendidikan Ganesha, 4.*

National Research Council. 1996. *National Science Education Standards.* Washington, D.C:: National Academy Press.

Wenning, C. J. 2005. Levels of Inquiry: Hierarchies of Pedagogical Practices and Inquiry Processes. *Journal of Physics Teacher Education Online,* 2(3), February 2005, pp. 3- 12. Diperoleh tanggal 9 September 2014, dari http://www.phy.ilstu.edu/jpteo/.

_____. 2005b. Implementing Inquiry-Based Instruction in The Science Classroom: A New Model For Solving The Improvement-of-Practice Problem. *Journal of Physics Teacher Education Online*, 2(4): 9-15.

_____. 2011. The Levels of Inquiry Model of Science Teaching. *Journal of Physics Teacher Education Online*. 6(2), Summer, pp. 2-7