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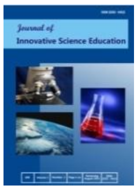

Influence of Guided Inquiry Model on Students Cognitive Learning Outcome in Stoichiometry Topic

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Abstract

Teacher as a facilitator is expected to explore the potential of students to be able to master the material with minimal mastery. This research aims to understand the concept of students' increased understanding of the material stoichiometry with guided inquiry learning model application. Experimental research conducted in SMAN 6 Semarang. The research sample is determined by purposive sampling class X MIPA 7 (an experimental class with 36 students) and Class X MIPA 8 (a control class with 36 students). Theused instrument is a cognitive achievement test. Analysis of students' cognitive learning outcomes data using the N-gain average test obtained 80.94%, with the average of an experimental group of students by 83.00% and theaverage of control group students by 76.94%. Achievement of experimental class minimum completeness criteria 91.67% and a standard deviation of 6.21 is higher than the minimum completeness criteria for achievement grade control by 69.44% and a standard deviation of 7.38. The t-test analysis obtained t value of 57.61 is greater than t table at a significance level of 0.05 by 2.03. The results of the analysis stated that there is significant influence guided inquiry learning model application of the cognitive achievement of students on the concept of stoichiometry.

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INTRODUCTION

The enforcement of curriculum in 2013 which was revised in 2017 requires the teacher as a motivator to explore and develop the potential of students optimally match the diversity in intellectual abilities, the multiple intelligences, cognitive ability and creativity of students and as a facilitator to facilitate learning with fun and challenging (P4TK, 2017). The learning process that takes place in the classroom is a development process of the full potential of students and intended that students successfully master material according to indicators that have been appointed with mastery by at least 75% (Arikunto, 2009).

The learning process all this time is less in involvement students actively, intelligently process emotions, critical, creative, motivation and good character.Permendikbud No. 58 of 2014 on Standards for Primary and Secondary Education Process implies the need for a learning process that is guided by the principles of scientific approach/ scientific. The application of the scientific approach to encourage students to learn and get used to discovering the scientific truth, not the opinion given a phenomenon. Students are trained to be able to think logically, the continuous and systematic way, using higher level thinking capacity (High Order Thinking/ HOT).

One model of learning that supports the principle of the scientific approach is an inquiry. This model allows students to actively and maximum to the point that they find their concepts or new knowledge. Students who are not accustomed to using models of inquiry, it can be used as starters Guided Inquiry (Guided Inquiry). According to Crawford (2006: 618), inquiry learning strategy is a series of learning activities that emphasize the thinking process in understanding natural phenomena and find the concept of learning for themselves. The process of thinking through the question and answer between teachers and students. On the guided inquiry learning teachers only provide the materials and the problem to be investigated or analyzed by the students, then the students compose their procedures to solve the problem (Colburn, 2000). The main purpose of learning-based inquiry according to the National Research Council (2000) are: (1) develop the desire and motivation of students to learn the principles and concepts of science, (2) develop scientific skills of students so that they can work as a scientist, (3) familiarize the student work hard to acquire knowledge. Syntax inquiry learning model in general are: orientation, define problems, formulate hypotheses, collect data, test hypotheses, and concluding (Sanjaya, 2006).

Cheung (2011), A'yun & Dewi (2015)and Sa'adah & Kusasi (2017) stated that the guided inquiry learning model could improve the activity of students and student achievement.Hanson (2006), Matthew & Kenneth (2013) and Jack (2013) stated learning inquiry process-oriented and centred on students who use group learning,guided inquiry activity to develop the knowledge, the question to improve the ability to think critically and analytically, solve problems, and individual responsibility.

Activities guided inquiry can be used in the concept/materials Chemistry because it allows students to actively analyze and solve problems for contains concepts/ materials that describe the arrangement, composition, properties, and changes of matter and energy changes that accompany (Brady, 2012), One of the chemicals subject matter studied in class X is stoichiometric. Stoichiometric here exhaustible start atomic mass, molar mass elements and Avogadro's number, molecular mass, percent composition of the compound, the determination of empirical formulas and molecular formulas, the mole fraction, sampi hydrate compounds. Mol serves as a connecting unit mass quantities of substances, the number of particles, and the volume of the gases involved in chemical reactions.

Concept/ mol material is a material that is crucial in the calculation Kimia.Because mole is a unique unit that is only found in the chemistry course. However, some studies have found that there are still many students difficulty in understanding the concept of this mole

Sidauruk, (2005), Setyaningsih (2010), Bruck & Towns (2011), Kasiran et al. (2012) and Budiyono (2015),

Based on the above background, the problem is whether the application of guided inquiry learning model can improve student learning outcomes in a stoichiometric material. This study aimed to increase student learning outcomes in a stoichiometric material with the application of guided inquiry learning model.

METHODS

The research was conducted in SMA 6 Semarang from March to June 2018. The approach used in this study is a quantitative approach and the type of research used in this study using an experimental method with sampling purposive sample. Samples were class X SMA consisting of experimental class, namely X MIPA 7 with the number of students by 36 students as a group who received treatment in the form of learning by using a model of guided inquiry and control classes, namely X MIPA 8 with a number of students by 36 students who study with conventional models.

Instruments measuring learning outcomes in the form of test used to measure students' understanding of the material stoichiometry. Problem achievement test consists of 25 test items in an objective form (multiple choice). The quantitative data in the form of initial test scores and a final test with the following steps:

Determining Test Scores Learning Outcomes:

Scores are calculated from each of the students' answers that are correct. Scores obtained is then converted into a value with the following provisions:

Student scores $= \frac{Student\ Score}{Max\ score} x\ 100\%$

Gain calculation of normalized (N-Gain)

Calculating Gain normalized score based on the formula by Archambault (2008), namely:

N-Gain $= \frac{Postest\ score - Pretest\ score}{Max\ score - Pretest\ score} x\ 100\%$

Results Gain normalized scores are divided into three categories(Table1):

Table 1. Criteria normalized Gain

Percentage	Classification
N-Gain> 70	High
30-Gain ≤ N ≤ 70	moderate
N-Gain <30	Low

The average score gain is normalized (N-gain) between the experimental class control class used as data to compare the cognitive achievement of students. Testing of both the average difference between the experimental class and control class is done with "t-test" (Russefendi, 2001). As the terms t-test data between the experimental class and control class must normally be distributed and have the same variance (homogeneous).Independent t-test was used in this experiment.

To determine the value of "t-test" the first standard deviation calculated combined. Before analyzed by t-test, first tested the normality (N-gain), and the homogeneity of the experimental class and control class. If the test results indicate the data normally distributed and homogeneous, then followed with two different test average, which was performed using SPSS 16 for Windows, the Kolmogorov-Smirnov test to determine the normality of the data obtained. Levene's test is used to determine the homogeneity of variance data. Data cognitive learning outcome is measured by calculating the difference in score pretest and posts. Hypothesis experiment for the cognitive learning is done by using a 0.05 significance level to test the following criteria: if t <t-table, then Ho is accepted and Ha is rejected, Conversely, if t count>t table, then Ho is rejected,andHa accepted.

RESULTS AND DISCUSSION

Data in Table 2 obtained by students cognitive achievement test scores stoichiometric material evaluation.

Table 2. Students cognitive achievement test scores

Statistical	Learning outcomes	
	Guided Inquiry	conventional
The number of students	36	36
Average value	83.00	76.94
The highest score	94	88
The lowest value	72	60

The results of students' cognitive learning SMAN 6 Semarang in a stoichiometric material with the application of guided inquiry to get the average value of the N-gain between the experimental class (80.94) was higher than the control group (73.38). So there are differences in the use of guided inquiry learning model with conventional learning towards improving student learning outcomes. N-Gain Difference scores between experimental class control classare shown in Figure 1.

Table2 shows the value of cognitive ability posttest experimental class students is higher than the control class. Value posttest cognitive abilities of students in the experimental class are 83.00, while the control class 76.94. The average score of N-Gain experimental class are:

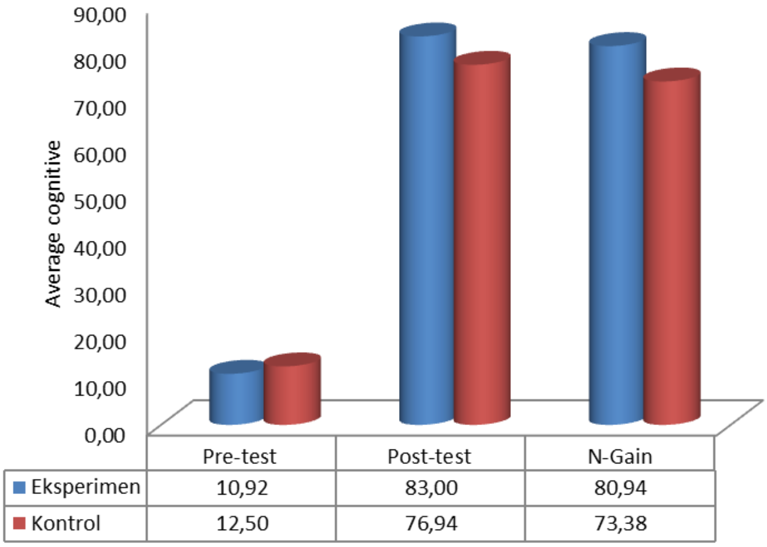

Figure 1. Difference Score N-Gain Control Class and Experiment class.

80.94 with high criteria, whereas in the control class 73.38 with high criteria, appropriate Table 1.Student learning outcomes experimental group mean = 83.00% and control group students on average 76.94%. Achievement of experimental class minimum completeness criteria 91.67% and a standard deviation of 6.21 is higher than the minimum completeness criteria achievement grade control 69.44% and a standard deviation of 7.38. the t-test analysis of the results obtained by value t count equal to 57.61 while the t-table on the 0.05 significance level of 2.03. Student learning outcomes in a stoichiometric material (the concept of mol) both classes thatbeing testedis increased. So learning activity in the experimental class is more effective than learning activity in control class.

Cognitive learning outcome differences between experimental and class control class due to the different learning process is given. In the experimental group, the learning process using guided inquiry learning model that is teacher explains the steps briefly guided inquiry,and then the students performed these steps and discussed with each group so that students get the concept of moles to hydrate compound. Simple questions and of everyday life are presented and explored by the students themselves so that students get a group together certain conclusions begin moles to compound hydrate concept. The learning process is done until lab hydrate compounds.

The process of learning in the control class takes place conventionally with lectures and group discussions, the teacher explains the teaching materials to students,and then the students were asked to hold discussions. During the learning process, students are not active in responding to the lessons so that there is a reciprocal relationship between teacher and student. It affects the outcome of cognitive learning, where learning outcomes control class lower than the experimental class. So learning by using guided inquiry learning model affect the improvement of student outcomes in a stoichiometric material (the concept of mol).

Application of learning models guided inquiry is intended to improve the achievement of learners.Through this learning, students learn how to find the concepts from the provided question, to collect the information, and to asses their temporary conclusion. After those steps, the student is expected to conclude the desired concept by theirself. Students learned the specific material,while the teacher focused and helped the student to transfer knowledge to understand the real-world problems so that students gain the knowledge and essential concept of the subject matter provided.

Some relevant research, such asMatthew & Kenneth (2013), declare thatthe guided inquiry model capable of influencing student learning outcomes significantly. According to Wardani et al. (2016)guided inquiry model capable of influencing student learning outcomes significantly.According to Rahayu et al. (2014), Wahyuningsih et al. (2014), Yotiani et al. (2015), and Wiyanto et al. (2017) the characteristics of inquiry learning model is suitable if applied to the concept or active material that allows students to analyze and solve problems systematically.

CONCLUSION

Based on the results of research and discussion can be concluded that the implementation of guided inquiry learning model which took place in class X MIPA 7 SMAN 6 Semarang in a stoichiometric material (mole concept) hadaverage enforceability of 91.67% and included in the excellent category. The application of guided inquiry learning model also provides cognitive learning outcomes of students better.Judging from the results of the study, the learning with guided inquiry model in other materials should pay attention to classroom management and allocation of time well to achieve as expected.

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