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Contribution of Assisted Inquiry Model of E-Module to Students Science Process Skill

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Abstract

This experimental study aims to know is there any contribution aided model of guided inquiry e-module of the science process skills of students. The experiment was conducted in SMA Institut Indonesia on 28 March to 24 April 2017. The samples are two classes using cluster random sampling technique for normally distributed populations and homogeneous. The study design used is modified comparison group pretest-posttest design. The study design used is the mean difference test, analysis of the influence between variables, and the determination of the coefficient of determination. The test results show the mean difference 5.03 t greater than t table at the 5% significance level is 1.99. Analysis of the influence between variables produce biserial coefficient value of 0.74. Calculation of the coefficient of determination shows the application of guided inquiry-aided model of e-modules accounted for 29.16% of the science process skills. Results of science process skills of observation showed that the proportion of students who achieve the experimental class was excellent and good categories was 0.51 higher than the control class is 0.25. Based on the results of this study concluded that the application of guided inquiry assisted e-module contributes to the students' science process skills.

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INTRODUCTION

Chemistry is essentially a way of finding out and understanding of a systematic nature. Chemistry is taught not only by simply providing an understanding of the notion, facts, concepts, principles, but also the invention through the search process with concrete actions. Based on the characteristics of the chemical sciences, chemistry learning at this time is not only focused on the product but also on the process. Mastery of a good process will produce a good product anyway (Utami et al., 2013).

Lessons are exposed to a non routine problems will lead to a meaningful learning for students (meaningful learning) and to teaches students to have the mindset right in solving the problem. Meaningful learning related to the student's ability to connect various information possessed by the information that is being studied. (Kuhlthau, 2010)

Sund and Trowbridge (Mulyasa, 2007: 109) distinguishes inquiry model into three kinds, namely the model of guided inquiry (guided inquiry approach), Inquiry modified (modified free inquiry approach) and free inquiry model (free inquiry approach). Guided inquiry requires that teachers have a more active role in defining the problems and steps to solve them. While in free inquiry model, students play an active role in defining the problems and find the problem.

Learning inquiry (inquiry) is a series of learning with the emphasis on the process of thinking critically and analytically to seek and find their own answer to the problem in question (Abdi, 2014). Just because students are designing procedure itself, does not mean that teachers play a passive role because students need guidance on the procedures they want (Banchi, 2008).

Research Matthew and Kenneth (2013) demonstrates the application of guided inquiry model can improve student learning outcomes. This is because the guided inquiry learning model provides a direct experience of the student as well as involving active students to find their own concept. Some studies show that the practicum through inquiry learning can improve students' cognitive abilities, scientific attitude and science process skills (Ergul, 2011).

According Aktamis and Ergin (2008) science process skills become an important tool to learn and understand the science, it is also important to obtain knowledge about science. Science process skills are the ability or proficiency to carry out an act in the learning of science to produce concepts, theories, principles, laws, and facts or evidence. (Ozgelen, 2012).According DeHaan (2009: 172) learning is done through the discovery and acquisition of real experiences with the help of tools, materials, or other learning media and the role of teachers as facilitators prepare learning environment, enabling students to obtain various optimal learning experience.

Hydrolysis concept is one of the chemical concepts that have characteristics as an abstract concept concrete example so as to be able to visualize the concepts needed a teaching material.Most students can work on the problems and trained in mathematical calculations, but do not understand chemistry concepts underlying questions. (Gabel, 2006).

Sitepu (2012) explains that the information and communication technology and the growing influence on education, especially in the learning process that can support active learning, effective, efficient, innovative and creative by using electronic module (E-module) as teaching materials. A teacher is required in addition to careful in selecting and applying the appropriate teaching methods with the objective to be achieved, it is also capable of selecting the appropriate media to convey the material to facilitate the necessary materials so that one can be developed media is an interactive learning module in the form of electronic modules (E-module). (Tejo Nursito, 2011: 20).

Therefore, the need for efforts to be made to improve the results of science process skills. One is the application of guided inquiry learning model-assisted e-modules. Assisted guided inquiry learning e-modules are applied so that students are free to develop concepts that they learn not only limited to the material recorded only then memorized (Yulianingsih & Hadisaputro, 2013), In addition, the model-assisted guided inquiry e-modules can improve the understanding of the concept and motivation to learn because students are actively involved in the investigation. This investigation has the stages of learning that can be used to train science process skills(Wulanningsih et al., 2012).

The problems of this study were (1) is there any contribution assisted guided inquiry model application e-module of the science process skills of students? (2) If there is influence, how much influence the inquiry model of guided assisted e-module of the science process skills? The purpose of this study were (1) to determine whether there is contribution-assisted guided inquiry model application e-modules to the students 'science process skills, and (2) to determine the influence of guided inquiry-aided model of e-modules to the students' science process skills.

METHODS

This research was conducted in SMA Institut Indonesia on March 28 to April 24, 2015. This type of research is conducted experimental research. The research design was modified comparison group pretest-posttest design by comparing the value of learning and science process skills of students of the second grade after being given a different treatment. Samples are 2 of the 5 classes using techniques cluster random sampling, because the normal distribution and homogenous population (Sugiyono, 2007), The independent variable in this study is a model of learning. Variations in treatment is guided inquiry learning model for experimentation and learning classroom lectures for the control class. Dependent variable is the students' science process skills.

Data collection method used is the method of testing, observation, documentation, and questionnaire. Data collection instruments include about posttest learning outcomes which consists of 45 items about science process skills, observation sheets science process skills, and questionnaire responses of students to learning. The data analysis technique used is the average of the test right hand, an analysis of the influence between variables, and the determination of the coefficient of determination. Results observation aspects of science process skills were analyzed descriptively.

RESULTS AND DISCUSSION

The results of this research include learning outcomes data, the data science process skills, and student questionnaire responses to learning. Learning outcomes of learning outcomes include cognitive, affective, and psychomotor. There are 10KPS aspects studied that is observe, predict, hypothesize, ask questions, designing experiments, using tools and materials, classify, interpret, apply concepts, and communicate.

Contributions models guided inquiry against science process skills gained from observation and posttest value. There are 8 aspects of science process skills were assessed through posttest namely skills (a) observing, (b) classifying, (c) interpreting, (d) forecast, (e) ask questions, (f) hypothesize, (g) the planned trial, and (h) apply the concept. Data posttest results of science process skills in every aspect is presented in Figure 1.

Achieved the highest aspect of the experimental class is the skill of designing an experiment as shown in Figure 1, During the manufacturing process of experimental design, experimental class students must accumulate linked references experiment, prepare tools and materials as well as analyzing the information obtained in order to work steps are designed in accordance with the experiments to be performed. This makes the experimental class students are trained to design experiments that could apply in answering the questions.

Figure 1. Results posttest Every Aspect of Science Process Skills

Skills class hypothesize experimental and control presented in Figure 1 shows a striking difference. The experimental class have hypothesized higher skills because the students are trained to formulate the hypothesis that students should make provisional estimates of experiments to be performed. Skills to apply the concept the experimental class also higher than the control class. This shows that with the application of guided inquiry students are able to use the concepts learned in new situations.

Science Process Skills impact on the understanding of science process material that students will be able to answer the question of being able to use the concepts learned (Arifin et al., 2015), Achievement of both classes on aspects foresee still relatively low, which means students have not been able to use the patterns observed to express what might happen to a condition. So, good teachers in the classroom and in the field should be to master the material in order to guide the students with both in developing the skills predict.

There are 10 aspects of science process skills were assessed through observation of skills (a) observing, (b) forecast, (c) hypothesize, (d) ask questions, (e) designing experiments, (f) using tools and materials, (g) grouping, (h) interpreting, (i) apply the concept, (j) communicate. The observations were made by three observers. Data recapitulation students' science process skills of observation are presented in Table 1.

Table 1. Summary of Observations Science Process Skills

interval Value	Practical activities		Activities in the Classroom	
	Experiment	Control	Experiment	Control
$85 \leq$ value <100	15	2	9	1
$70 \leq$ value <85	16	13	21	12
$55 \leq$ value <70	2	9	3	10
$40 \leq$ value <55	0	2	0	3
$25 \leq$ value <40	0	0	0	0

Experimental class science process skills are better developed than the control class. It can be seen in Table 1, whichthe proportion of experimental class students achieve excellent and good categories was 0.51 higher than the proportion of students in the control class 0.25., Data from observation of every aspect of science process skills are presented in Figure 2.

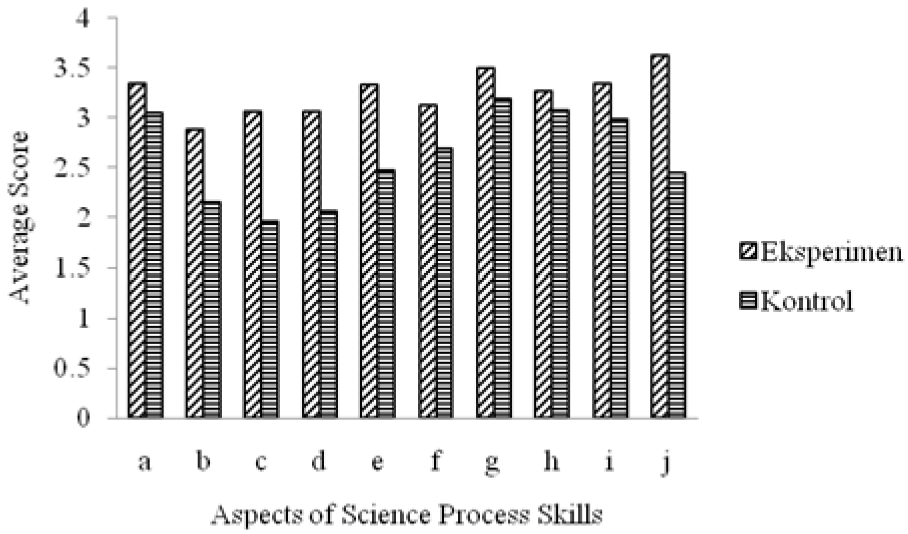

Figure 2. Observations Every Aspect of Science Process Skills Students

The most striking difference between the results of the experimental and control classes based on Figure 2 are the aspects of communication, ask questions, and hypothesize. That is because the experimental class students are taught to discuss and presentations that foster self-confidence in communication. Guided inquiry learning gives students the chance to participate actively during the learning process because it can raise the curiosity and confidence in asking questions or argue(Rahmawati et al., 2014), The experimental class have hypothesized higher skills because students are already accustomed to practice hypothesized on exploration activities. Lowest aspects are achieved by the control class is hypothesized because students have not been used to learning in accordance with the scientific method.

Grade students experiment and control group were able to make observations well as presented in Figure 2 that the two classes have achieved both categories at observing aspects. Students have been able to use as many senses to make an observation and is also able to use the relevant facts and adequate observations. However, the experimental class have the skills to observe better for having designed the experiments independently so that students are aware of what must be carefully observed in experiments(Arifin et al., 2015),

Data regarding the science process skills test results and observations in Figure 1 and 2 in accordance with a study stating that the science process skills can be enhanced through inquiry-based learning lab (Siska et al., 2013), Models have guided inquiry learning stages that can be used to train students' science process skills (Wulanningsih et al., 2012), Therefore, the application of guided inquiry model contributes to the students' science process skills.,

On average posttest results of experimental class learning and control of 82.3 and 75.4. Test calculations mean the right side obtained t 5.03 greater than t table with 57 degrees of freedom at the 5% significance level of 1.99. This means that the average results of experimental class learning better than the control class. The results of data analysis showed biserial correlation coefficient of 0.74, which means that the effect of the application of the model of guided inquiry learning outcomes chemistry is relatively low leverage(Sugiyono, 2007), Calculation of the coefficient of determination shows that the application of guided inquiry model accounted for 29.16% of the students' science process skills, while

84.98% of learning outcomes are influenced by other factors not examined in this study. These factors, among others, the level of difficulty of the material, instructional media, and facilities and infrastructure(Aktamis & Ergin, 2008),

On average posttest experimental class science process skills and control of 75.05 and 61.86. Test average of the right side obtained t of 3.51 is greater than t table with 57 degrees of freedom at the 5% significance level of 2.00. The results of data analysis showed a correlation coefficient of 0.53 and classified biserial effect being (Sugiyono, 2007), Calculation of the coefficient of determination shows that the application of guided inquiry model accounted for 28.09% of the students' science process skills.

Results of the analysis of students' responses to the study questionnaire showed that students responded positively to the enforceability of the guided inquiry learning models by an average of classical student responses at 33. The average value of these classical included in both categories. Students found applied learning have increased motivation to learn and curiosity, as well as help students understand the material. It shows that the students gave a positive response to the application of guided inquiry learning model.This research was supported by Sofiati (2014) with the finding that the inquiry learning model can improve students' science process skills.

CONCLUSION

Implementation of guided inquiry model accounted for 29.16% of the students' science process skills. Results of science process skills of observation showed that the proportion of students who achieve the experimental class was excellent and good categories was 0.51 higher than the control class is 0.25. Based on the results of this study concluded that the model guided inquiry learning outcomes and contribute to students' science process skills.

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