

IMPLEMENTATION OF GUIDED INQUIRY LEARNING MODELS WITH NESTED METHOD TO INCREASE CRITICAL THINKING SKILL FOR ELEVEN-GRADE STUDENT AT SMA NEGERI 1 MANYAR GRESIK IN REACTION RATE MATTER

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Abstract

This aims of the research are to know critical thinking skills and the response of students in reaction rate matter through the implementation of guided inquiry learning model with nested method. Research design that used is one group pretest posttest design at XI MIA 7 SMA Negeri 1 Manyar Gresik. Instruments that used in this research is implementation observation sheet, pretest and posttest sheets, and questionnaire response's students. This research data analyzed by descriptive quantitative method. It can be concluded that (1) The implementation of learning model in two meetings, has the average percentage of meeting I is 94.44% and meeting II is 97.22% which means both of it in very good category. (2) The critical thinking skill of students increases from pretest to posttest as shown by a 100% students passed which mean the critical thinking skill that train increase. (3) Student response is 96.41% for implementation of guided inquiry with nested method

Keywords: Guided Inquiry, Nested, Critical Thinking Skill, reaction rate.

INTRODUCTION

According to UU No. 20 of 2003 about National Education System in Chapter I Article 1 stated that education is a conscious effort and planned to create an atmosphere of learning and learning process so the learners are actively developing their potential to have spiritual strength, self-control, personality, intelligence, noble character, as well as the necessary skills of himself, society, nation and state [1].

Essentially, education can be obtained from primary school to college through the learning process. Learning is a social and cultural activity which learners build their meaning that influenced by the interaction of knowledge and their new learning experiences. In the learning curriculum is indispensable [2].

In accordance with the objectives of the curriculum 2013 that listed in the attachment of Permendikbud Number 70 of 2013, the curriculum 2013 aims to prepare Indonesian people to have the ability to live as individuals and citizens who are faithful, productive, creative, innovative and affective and able to contribute to the life of society, the state, and the civilization of the world.

Depdikbud 2013 stated that the chemistry subjects in the curriculum 2013 is one of the

subjects of Mathematics and Natural Sciences. Chemistry connects with how to find out about natural phenomena systematically, so the learning process is not just a collection of knowledge include of facts, concepts, or principles but also a process of discovery. After studying chemistry, students are expected to get experience in applying scientific methods, through experiments and their application to solve problems in daily life.

Based on pre-research results almost 60% of students consider the subjects of chemistry is a difficult subject while the rest of all say the opposite. Chemistry learning at school is using rote methods, it makes learning not in line with the purpose of national education. This is also reinforced by the results of pre-research that almost 97% of students assume that the way of deliver of class materials as a cause of chemistry subjects difficult for students. This is reinforced by the number of students' responses of 57% who favor learning with experiment rather than lecture methods that only produce a response of 16%.

Based on Permendikbud No. 23 of 2006 about the purpose of Competency Standards of Education Unit (SKL-SP) for SMA, students must show the ability of logical thinking, critical, creative and innovative in decision making [3].

Critical thinking is mentioned as one of the future competencies needed to be have by students.

Critical thinking is a reflective and reasoned way of thinking that focused on making decisions to solve problems. Critical thinking is divided into three stages and there are six major skills involved. Those skills are interpretation, analysis, evaluation, interference, explanation and self regulation [4]. Based on interviews with teachers, critical thinking skills never been trained or applied before. This evidenced by the results of critical thinking skills tests on some components with result for interpretation of 8%, analysis of 14%, inference of 0% and 3% explanation. In the early stages only trained some components before heading to the higher levels. In this case needed for assistance to solve the problems above accurately. Critical thinking skill as a (1) deep thinking of the problem in environment, (2) realistically reasoning about knowledge, (3) method implementation skills [5]. One of the learning model that can help students to develop their critical thinking skills is Guided Inquiry. Based on interviews with classroom teachers, stated that inquiry-based learning has never been applied before.

Inquiry process can find the new thing and new knowledge [6] Inquiry learning can develop a scientific way of thinking that places students as learners to solving problems and acquiring knowledge by inquiry to understand the concepts of science. But there are lack of inquiry learning is the atmosphere of the class becomes crowded and discussion activities not maximized. So, needs to be an integrated for inquiry learning to be more effective in optimizing students' critical thinking skills.

The integrated learning model is a learning system that enables students, both individually or in groups, actively search, explore and discover concepts and scientific principles holistically, meaningfully and authentically. Integrated Nested is a learning that combines thinking skills, social skills, and organizing skills [8].

Based on the descriptions above, the researcher considers it necessary to apply Guided Inquiry learning model with Nested approach to improve students' critical thinking skill.

METHOD

This is a pre-experiment research with quantitative descriptive method. The research design that used is one group pretest posttest design. The study design is illustrated as follows.

$$O_1 - X - O_2$$

Information :

O₁: Observe the students' before give the treatment with guided inquiry model with nested method.

X: Treatment, which is implementation with guided inquiry model with nested method.

O₂: Observe students' after give treatment with guided inquiry model with nested method.

Implementation observation sheet is a sheet created to determine the implementation of the learning model Guided Inquiry in accordance with the stages of the learning model. Critical thinking skills test sheet is a test that given to determine the ability of students' critical thinking skills during pretest and after application of the students is given a final test (posttest) of the results of the two tests will be compared to the ability of improvement critical thinking skills students to the reaction rate matter. The form of the test is essay based on the indicator that used. The student response questionnaire is a sheet created to find out the student's response to the learning model and the learning materials provided.

Percentage of learning activity is calculated using the following formula:

$$\% \text{ Implementation learning model} = \frac{\sum \text{Total Score}}{\text{Maximum Score}} \times 100\%$$

The data obtained is then converted into the following scores:

- a) Score 0% - 20% : Very Low
- b) Score 21% - 40% : Low
- c) Score 41% - 60% : Medium
- d) Score 61% - 80% : Good
- e) Score 81% - 100% : Very Good

[7]

Analyze critical thinking skills are done by calculating the value of <g> to find out how much increasing from pretest to posttest.

$$<g> = \frac{\text{posttest score} - \text{pretest score}}{\text{maximum score} - \text{pretest score}}$$

[9]

The data obtained is then converted into the score that shown by Table 1.

Table 1. Gain Score Criteria

<g> score	Criteria
<g> ≥ 0,7	High
0,7 > <g> ≥ 0,3	Medium
<g> < 0,3	Low

[9]

Analysis of student responses to the learning process based on Guttman scale shown in Table 2.

Table 2. Guttman Scale Criteria

Answer	Score
Yes	1
No	0

[10]

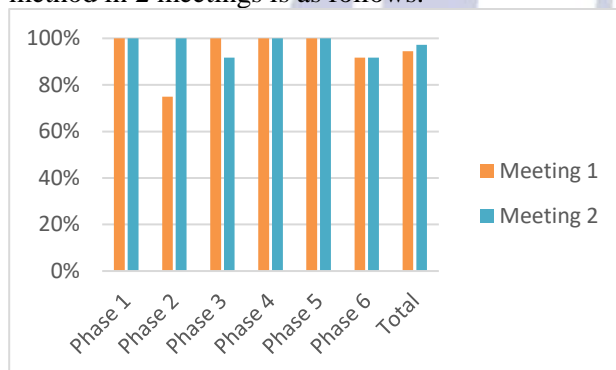
Data of student response result is analyzed with descriptively quantitatively way by describing percentage in each question. Calculation of each category is analyzed by percentage as follows:

$$\text{Percentage of Answer} = \frac{\sum \text{Yes Answer}}{\sum \text{Responden}} \times 100\%$$

RESULTS AND DISCUSSIONS

Learning Implementation

The result of observation of implementation of guided inquiry with nested method in 2 meetings is as follows.



Graph 1 Percentage of Implementation Learning Model

The lessons that learned in two meetings has the aim made the students more active in finding the concept by given the phenomenon using their critical thinking skills. Teachers have a role as a mentor and facilitator for students so students can learn by their critical thinking skill to finding a concept of a phenomenon in daily life. Teachers start learning by giving some phenomena that exist in daily life, and students are guided to be able to find the concept with their own ability [11].

Phase 1 is the focuses the student's attention and explains the inquiry process. In this phase, the teacher prepares students to learn and explain the procedure of inquiry process to the students that is discussing the purpose of learning, motivating students to be actively in the activities of finding concepts and checking the attendance of students (some students do not attend lessons because of non-academic activity) [2]. The teacher gives apperception on the students by asking about the material that has been studied and explaining how the material will be delivered using the implementation of the Guided Inquiry learning

model. Apperception is an important learning activity because the students' are invited to recall previously knowledge that have been learned. The average of implementation in phase 1 in the first meeting is 100% (Very Good) and in phase 1 in the second meeting is 100% (Very Good).

Phase 2 presents the problem of inquiry. In this phase, the teacher presents the problem form as phenomenon with related matter to the students [2]. At the meeting the teacher presents the inquiry phenomenon to the students related to the material that is the factors influencing the reaction rate. The teacher displays picture about the phenomenon about concentration, surface area, temperature and catalyst to students. After the presentation of the picture done by the teacher on the slide, the question is arises from students' and their become curios about the material to be studied. Presenting phenomom by teachers related with the characteristics of inquiry learning which states that in organizing teaching, teachers can present interesting problems / phenomena that cause questions of students. The average of phase 2 in the first meeting is 75% (Good) and in the second meeting is 100% (Very Good).

Phase 3 asking students to formulate hypotheses to explain the problem. In this phase, the teacher helps students by asking about the problem and formulate the hypothesis which will be proven. This phase begins with the division of 6 groups, each group contains of 5-6 students [2]. After the group is formed the teacher guides the students to the groups then distributes the worksheet to each student contained in the group. The learning in schools should have a purpose (Purposeful) that encourages students to conduct some investigations with their small groups according to their interests. This is in accordance with the characteristics of inquiry learning model that is characterized by cooperation among students with one another in a small group to doing tasks and increase the opportunity to obtain information from other partners, the development of thinking and social skills. The research process will encourage students to learn, through their active involvement with concepts, principles and teachers encouraging students to have experience and doing experiments that enable them to find principles independently [13]. It accordance with phase 3 that students are guided to find their experiences independently with strong encouragement from the teacher to make it happen. The average of phase 3 in the first meeting is 100% (Good) and in the second meeting is 91.66% (Very Good).

The activity in phase 4 is encourage students to collect data to test the hypothesis. In this phase the teacher asks students how to collect data to prove the hypothesis [2]. In this phase, the teacher is assigned as a facilitator when guiding the experiment, directing the students to write the observation result in the observation table at worksheet, guiding the students to process the observation result and analyzing the observation data, and guiding the students to do the evaluation questions that contained in the worksheet. The inquiry is a method that prepares students in situations to conduct their own experiments extensively in order to see what is going on, wants to do something, ask questions, and looking for their answers, and connect one to another research, comparing what it finds to what other students find [12]. On this phase also train students to nesting their knowledge to solve the problem using nested method. Nested method trained by made the table after got the data and change it into the graph. Nested is the method that combine all skills that students had. Nested divided the skills into 3 are: knowledge skill, social skill and graphic organize [8]. Skill that used in this reseach is knowledge skill and graphic organize. The average of phase 4 in the first meeting is 100% (Good) and in the second meeting is 100% (Very Good).

Phase 5 is to formulate explanations and / or conclusions. This activity on this phase is the teacher closes inquiry by asking students to formulate the conclusions [2]. In this phase, the teacher guides the students to recall and collect the information obtained from the beginning to make the conclusions by considering the hypothesis that previously been made. The teacher also connects the theory that the student has gained to make a conclusion. After all the above components are done, the teacher guides the students to fill the conclusions that have been presented on the worksheet based on the experiment. The average of phase 5 in the first meeting is 100% (Good) and in the second meeting is 100% (Very Good).

Phase 6 is to reflects the problems and thinking processes during the investigation. In this phase, the teacher asks the students to think through their thinking process and reflect on the investigation process [2]. In this phase the teacher guides the students to prepare the results that have been obtained through experiments to be presented in front of the class. The teacher acts as the leader of the discussion among the students who presented with the students who will ask questions. In this case the teacher will straightens knowledge that wrong. The results presented by the students

include the results of experimental data, the way taken to obtain the results. At the end of phase 6 the teacher end the learning with pray and greetings. The average in phase 6 at the first meeting is 91.66% (Very Good) and at the second meeting is 91.66% (Very Good).

Based on the above description, the syntax of learning with Guided Inquiry model at meetings I and II are done very well. Students can find concepts by finding information on the phenomena that presented in daily life with critical thinking skills. Inquiry can train students in process of investigating and explaining phenomenon, besides that its able to ask students to do the same thing as scientists in an effort to organize knowledge and create some principles [12]. The ability thinking of the students develops in line with the problem solving process. Students will not be able to conduct an investigation to find a solution if the student does not have the critical thinking ability to some problem. This observation is conducted to show that in its implementation the teacher has implementing Guided Inquiry syntax and can also train students' critical thinking skills during the learning process in the classroom.

Critical Thinking Skill

There are six critical thinking skills those are interpreting, analyzing, evaluating, inference, explanation, and self-regulation [11]. There are four critical thinking skills that used on this reseach. The tests was given is pretest and posttest, where pretest was given before the implementation of the Guided Inquiry and posttest was done after the implementation of the Guided Inquiry model. The question used to find out the improvement of students' critical thinking skills. The average pretest and posttest values of each item can be seen as follows.

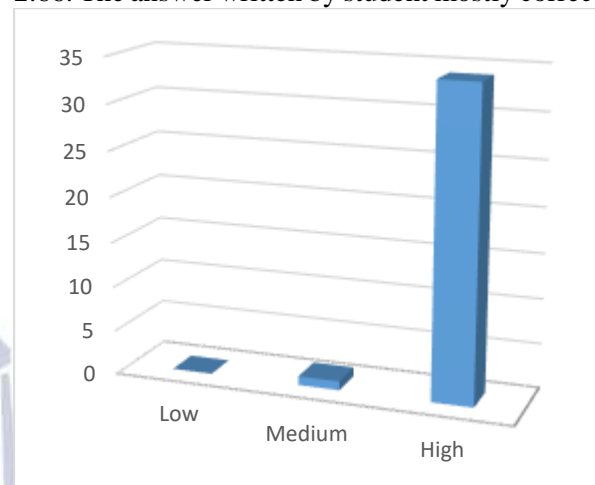
Table 3. Pretest and Posttest Result

No	Name	Pretest Average	Complete	Posttest Average	Complete
1	S1	0.08	Incomplete	3.42	Complete
2	S2	0.46	Incomplete	2.87	Complete
3	S3	1.04	Incomplete	3.75	Complete
4	S4	0.46	Incomplete	3.00	Complete
5	S5	0.42	Incomplete	3.67	Complete
6	S6	0.42	Incomplete	3.71	Complete
7	S7	0.08	Incomplete	3.38	Complete
8	S8	0.04	Incomplete	4.00	Complete
9	S9	0.17	Incomplete	3.71	Complete

No	Name	Pretest Average	Complete	Posttest Average	Complete
10	S10	1.46	Incomplete	4.00	Complete
11	S11	0.08	Incomplete	3.88	Complete
12	S12	0.58	Incomplete	3.46	Complete
13	S13	0.25	Incomplete	3.50	Complete
14	S14	0.25	Incomplete	3.46	Complete
15	S15	0.13	Incomplete	3.75	Complete
16	S16	0.25	Incomplete	3.63	Complete
17	S17	0.21	Incomplete	3.42	Complete
18	S18	1.29	Incomplete	3.29	Complete
19	S19	0.04	Incomplete	2.92	Complete
20	S20	0.08	Incomplete	2.92	Complete
21	S21	0.13	Incomplete	3.58	Complete
22	S22	0.00	Incomplete	3.54	Complete
23	S23	0.29	Incomplete	3.63	Complete
24	S24	0.21	Incomplete	3.50	Complete
25	S25	0.00	Incomplete	3.54	Complete
26	S26	0.08	Incomplete	2.92	Complete
27	S27	1.37	Incomplete	3.75	Complete
28	S28	0.96	Incomplete	4.00	Complete
29	S29	0.29	Incomplete	3.54	Complete
30	S30	0.17	Incomplete	3.13	Complete
31	S31	0.50	Incomplete	3.75	Complete
32	S32	0.79	Incomplete	3.21	Complete
33	S33	0.04	Incomplete	4.00	Complete
34	S34	0.04	Incomplete	3.38	Complete
35	S35	0.21	Incomplete	3.21	Complete

Pretest is used to measure students' critical thinking skills. Containing 6 questions. At the pretest value almost all students get the value below KKM that is ≤ 2.66 . This is because the students are still unable to connected the theories they have gained before with their newly theories, it can see by the number of students who answer not similiar with the indicators. Many students also do not answer because of confusion. When the learning takes place students are taught and trained to be able to answer the matter of critical thinking skills through worksheet. The answer written by student still incorrect so critical thinking skill in this component still low. After the students learning taught and trained to be able to answer the

matter of critical thinking skills through worksheet the value of posttest increase. At the posttest value almost all students get upper the KKM that is ≤ 2.66 . The answer written by student mostly correct.



Graph 2 The Value of Gain score

The graph above is the result of Gain score calculation of pretest and posttest value on guided inquiry model learning with nested method. From 35 students, it can be seen that there are no student in low category, 2.86% in medium category, and 97.14% got high category. So the accumulation of medium and high category amounted to 35 children who have a percentage of 100% which mean the critical thinking skill that train increase.

Students' Response

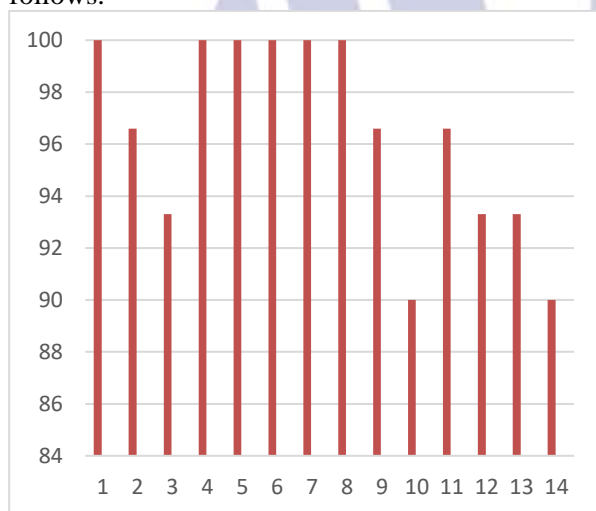
Student response in teaching and learning activities using Guided Inquiry model with Nested method is obtained by distributing a questionnaire that containing several statements. The statement includes the application of Guided Inquiry learning model with Nested approach which can guide students to be able to train some component of critical thinking skill. The student's response will get a positive result if the percentage earned $\geq 61\%$. The statement that presented can be seen on table 4.

Table 4. Statement Presented on Student Response

Aspect that rated
a. Learning model that used made me easier to understand the matter.
b. Learning model that used made me more independent
c. Learning model that used made me looking the information not just from the text book.
d. Learning model that used train me to: <ol style="list-style-type: none"> 1) Arrange the formulation of problems 2) Arrange the hypotesis

Aspect that rated
3) Collect the data through experiment to conduct the hypotesis.
4) Formulate the conclusion.
5) Reflecting the thinking process that used.
e. Learning model that used help me to become active in the lesson activity.
f. Learning model that used made me become curious.
g. Learning model that used help me to work together well.
h. Learning model that used help me to connected the matter with the phenomenon that happen in daily life.
i. Learning model that used very excited.
j. Learning model can used on all chemistry matter.

The students' response result can be seen as follows.



Graph 3 Students' Response Result

Based on the graph 3 almost all positive questions shows that the application of Guided Inquiry model with Nested method on the matter of factors that affect the reaction rate get the average percentage of 96.41% from each statement in student response questionnaire. On the J's statement there are 10% respondent that choose negative answer. It because the statement notice that the inquiry can used to all matter in chemistry subject. In the fact that the inquiry learning model used for the matter that have characteristic do some experiment. Because the principal of inquiry learning model are to prove the theory through some experiment.

CLOSURE

Conclusion

The conclusions from this research are:

1. Learning Implementation

The implementation of Guided Inquiry model with Nested method for increasing critical thinking skills in reaction rate matter obtained by percentage of 94.44% at meeting 1 and 97.22% at meeting 2.

2. Critical Thinking Skill

Skills that measured using a critical thinking skill sheet on the subject matter of the reaction rate for two meetings get results the accumulation of medium and high category amounted to 35 children who have a percentage of 100% which mean the critical thinking skill that train increase. The score showed increasing from pretest to posttest and get the high criteria value on Gain score on posttest value.

3. Students' Response

Student response after implementation of Guided Inquiry Model with Nested Method to increase critical thinking skills in reaction rate matter getting percentage from yes answer from statement given about learning that have done in class is 96.41%.

Suggestion

1. In critical thinking skills analysis component gets the lowest posttest average value, for further researchers need to pay attention and guide students in doing the analysis questions so that the value of that components maximum.
2. The guidance process on the Guided Inquiry learning model in this study is need a more perfect planning again, for further research need to pay attention to the phase when delivery the matter to the students so that the guiding process can be more maximum.

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