

IMPLEMENTATION OF GUIDED INQUIRY LEARNING MODELS WITH DEEP DIALOGUE AND CRITICAL THINKING METHOD IN SUBMATTER OF FACTORS THAT AFFECTING REACTION RATE AT SMA NEGERI 1 CERME

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Abstract

This research aims to know the applicability, students' activities, critical thinking skills, and the response of students in submatter of factors that affecting of reaction rate through the implementation of guided inquiry learning models with deep dialogue and critical thinking method. Research design that use is one group pretest posttest design in XI IPA 1 class at SMA Negeri 1 Cerme. The objective are 30 students which divided into six groups, each group consists of 5 people. Instruments that used in this research are applicability observation sheet, students' activity observation sheet, pretest and posttest sheets, and questionnaire response's students. How to analyze this research data with descriptive quantitative. It can be concluded in this research that (1) The applicability of learning in three meetings, meeting I and II by 93% and meeting III average percentage of 95% which means in very good category. (2) the activities of students in learning is very good with relevant activities greater than 61% that is 99.57% and not relevant only 0.43% (relevant activity > irrelevant activity). (3) The critical thinking skill of students increases from pretest to posttest as evidenced by N-Gain Score, where the accumulation of medium and high criteria is 96.67% which means very good. (4) student response is very good with percentage 100% in positive question and 96.67% in negative question.

Keywords: Guided Inquiry Model, Deep Dialogue and Critical Thinking Method, Factors that Affecting Reaction Rate

INTRODUCTION

Indonesia's Governments has made several efforts to improve the quality of human resources in Indonesia. One of the efforts made by the government is improve the quality of education in Indonesia by revising the new 2013 curriculum.

Curriculum 2013 states that knowledge can't be simply transferred from teacher to students. Students are subjects who have the ability to actively seek, manage, construct, and use knowledge. So, we need a learning process which can make student really understand and apply the knowledge.

Based on pre-research students' questionnaires at SMA Negeri 1 Cerme, as many as 85.71% of students have difficulty in learning in matter of Reaction Rate. Based on curriculum 2013, the subject matter of reaction rate is found in 3.7, ie determining the reaction order and reaction rate constant based on experimental data. The competence requires that students can interpret the factors that affecting reaction rate based on the experiments that have done. Factors that affecting reaction rate is the matter that has the characteristics of needing proof by experiment by asking students to investigate, analyze, and

conclude the results of the experiment. This is supported by the basic competence of 4.7 which is to design, perform, and conclude and present experimental results of factors that affecting reaction rate and reaction order. According to based competence, required a deep concept and conceptual understanding to implement it in the learning process. The importance of conceptual understanding in the teaching and learning process greatly influences attitudes, decisions, and ways of solving problems.

Based on interviews with teachers at SMA Negeri 1 Cerme explained that students only memorize the concept and less able to use the concept if they encounter real life problems related to concept they have. Based on it, the concepts in the matter of reaction rate must be confirmed by conducting the proof in a practical experiment. Practical activities can be done in groups, where each group is conducting an in-depth dialogue to dig information through observation, questioning, experimenting, then processing the data of practical results, presenting the data, followed by analyzing, reasoning, then conclude. This is correspond with the Regulation of the Minister of Education and Culture No. 20 of 2016 on the standard of graduation competency [1].

Based on interviews with chemistry teacher at SMA Negeri 1 Cerme said that students have never been taught to think critically during the learning process. In addition, the results of pre-research questionnaires that given to students showed as many as 85.71% expressed happy to leaning matter of reaction rate with practicum, as many as 60.72% of students have never been mentored to conduct discussion / dialogue in-depth to think in critical (in-depth) on the chemicals.

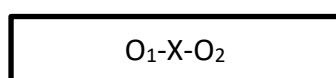
Based on these facts, needed a learning model that helps students in the matter of reaction rate which make easy to be understood by experimental method combined with lecture and discussion in applying guided inquiry learning model with deep dialog and critical thinking method.

Guided Inquiry learning model has a syntax of learning involves confronting the problem and explaining inquiry process, collecting data and verification of problem situations inquiry, collecting data and experimenting, organizing and formulating explanations, analyzing strategies inquiry and develop more effective inquiry [2].

Critical thinking skills of trained students are only four steps which include interpretation, analysis, evaluation, and inference which correspond to characteristic of the reaction rate that requires students to know the facts, and generate conclusions based on information provided through evidence using the Deep Dialogue and Critical Thinking (DDCT) method[3] [4].

METHOD

This type of research is a pre-experiment research with quantitative descriptive method. The research design that used is one group pretest posttest design with the targets of the research that will be conducted is students XI IPA 1 Class at SMA Negeri 1 Cerme in semester 1 of reaction rate matter. In the learning activities, 30 students were divided into six groups where each group consisted of 5 students. Division of groups heterogeneously. The research design is illustrated as follows.



[5]

Explanation :

O₁: Observe the students' early ability to use the pre-test value of critical thinking skills before

give the treatment with guided inquiry instruction model with deep dialogue and critical thinking method at SMA Negeri 1 Cerme of class XI IPA 1

X: Treatment, which is implementation with guided inquiry learning model with deep dialogue and critical thinking method to trill critical thinking skill at matter of reaction rate.

O₂: Observe students' end-ability with post-test value of critical thinking skill after give treatment with guided inquiry model with deep dialogue and critical thinking method at SMA Negeri 1 Cerme of class XI IPA 1

The tools that used in this research are Syllabus, Lesson Plan, and Learning Activity Unit (LAU). There are 4 LAU that is LAU 1 factor of concentration at reaction rate, LAU 2 temperature factor, LAU 3 Factor of Surface Area, and LAU 4 factors of Catalyst.

The instrument that used in this research is the observation sheet of the applicability used to determine the implementation of the guided inquiry model of learning, the activity observation sheet of students to find out the activities that exist during the learning process, the pretest and posttest sheets used to measure the improvement of critical thinking skills and response questionnaires used to determine the response of students after learning with guided inquiry learning model with deep dialgue and critical thinking method.

Percentage of learning activity is calculated using the following formula:

$$\text{Applicability} = \frac{\sum \text{observed aspect scores}}{\sum \text{all of aspects}} \times 100$$

Then the scores obtained can be converted with the following criteria:

Table 1 Interpretation of Scores

| Percentage | Categories |
|------------|------------|
| 0% - 20% | Very Low |
| 21% - 40% | Low |
| 41% - 60% | Medium |
| 61% - 80% | Good |
| 81% - 100% | Very Good |

[6]

Observation of students' activities was observed by 3 observers. Observation sheet of students' activity is measured by using the formula:

$$\%activity = \frac{\text{the frequency of activity that appears}}{\sum \text{frequency of activity}} \times 100\%$$

Analysis of critical thinking skills is done by calculating N-Gain Score from pretest and posttest by Hake formulated as follows [7]:

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

Furthermore, criterion of improvement of critical thinking skill shown by table 2.

Table 2 N-gain Score Criteria

| Percentage | Categories |
|-----------------|------------|
| $g < 0,3$ | Low |
| $0,3 < g < 0,7$ | Medium |
| $g > 0,7$ | High |

[7]

Data from the questionnaire of students' responses is calculated per percentage to determine the response of students after the implementation of guided inquiry learning model with deep dialogue and critical thinking method on reaction rate matter. Percentages for "Yes" and "No" answers can be calculated using the formula:

$$\% P = \frac{\sum F}{\sum N} \times 100$$

Explanation :

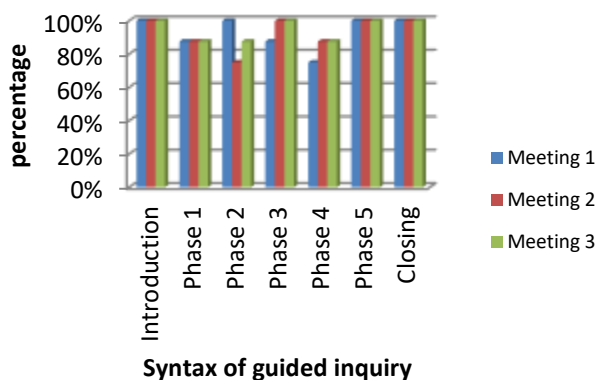
F = number of responses for answer Yes or No

N = the total number of students

RESULTS AND DISCUSSIONS

Learning Applicability

The result of observation of applicability guided inquiry model with deep dialogue and critical thinking method in 3 meetings is as follows.



Picture 1 Percentage of Applicability Phase

Based on Picture 1, it can be seen that the intermediate stages of preliminary activity, main activities, and closing activities have increased or decreased, and even have not been constantly rising or falling for three meetings. Based on Picture 1, the percentage of implementation phase, it can be seen that in the preliminary activities, phase 1, phase 5, and closing activities there is no increase or decrease from meeting one to three which means constant. Preliminary activities, phase 5, and closing activities receive a 100% percentage which means the category is very good, where all indicators are done very well and coherently. Although in phase 1 get a percentage score of 87.5% with very good category, where all indicators are met but there are indicators in the implementation of less than the maximum that is at the time of giving motivation in the form of phenomena associated with daily life that can provoke curiosity students. At the time of reading the phenomenon, students a little confused about the phenomenon because students in SMA Negeri 1 Cerme had never before given the phenomenon of life associated with the concept of chemistry.

Phase 2 decreased from the first meeting to second meeting from 100% to 75%. It cause in the second meeting the students are less serious in reading the phenomenon, so it takes a long time in identifying the problem. Despite the decline but still in good category. At the third meeting the Phase 2 percentage increased to 87.5%. At the third meeting of students in reading the phenomenon is good but little difficulty in identifying the problem.

In Phase 3 it increased from the first meeting to second meeting, where in the first meeting the implementation was 87.5% which was categorized very well. At this meeting there are indicators that are less good that is at the implementation of less conducive practicum because less management of the class when setting up the tools and chemicals. At the second meeting there is an increase that is to be 100% and constant at meeting three is also 100%, which means entry in very good category. At meetings two and three in phase 3, all indicators are done very well and coherently

In Phase 4 it increased from the first meeting to second meeting, where in the first meeting the implementation of 75% is categorized good. At this meeting there are indicators that are not good when analyzing data when writing the reaction and at the time of drawing Picture takes a

long time. At the second meeting there was an increase of being 87.5% and constant at the meeting of three also 87.5%, which means entering the category very good. At meetings two and three in phase 4, when describing the graph takes a little longer.

This research is accordance with the research before which discusses the guided inquiry learning model which by applying guided inquiry model can make the activity in the class work well, because in learning the students is guided to actively in finding a concept or idea of matter. Seen in this study, the first meeting got an average of 93% (very good), second 93% (very good), and third meeting got 95% average implementation which also means very good [8].

Implementation learning of guided inquiry instruction model with deep dialogue and critical thinking method in submatter factors that affecting reaction rate accordance with learning theory that support the research of discovery learning theory, Vygotsky social development theory, and Piaget cognitive theory. In Discovery Learning theory, Teachers give freedom to students to find concepts in accordance with the understanding of students who are guided by the Teacher. In this research, the teacher guides the students to broaden in finding the concept of factors affecting the rate of reaction begins with the teacher giving the phenomenon in life related to concept of reaction rate factor, after which the students identifies the phenomenon and formulates the problem based on the understanding of the individual then discussed with the group, making hypotheses, determining experimental variables, conducting experiments, analyzing data, and making conclusions[9]. To find the correct concept it is necessary to prove the relationship between the hypothesis with the conclusion whether appropriate or not. If it is appropriate then students have found the concept that is considered correct.

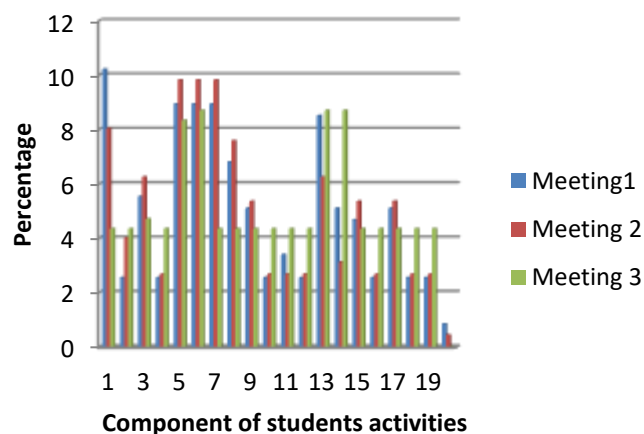
Vygotsky's social development theory gives the idea that students learn through interaction with adults and peers. In addition, learning occurs when children are working within the zone of proximal development [10]. In this research, learning about the factors of reaction rate is given phenomenon, the question which is in the nearest zone of students, so that students need help by discussing with teacher or other students to answer the question.

Piaget's cognitive theory states that each students develop their thinking skills according to a regular stage according to a certain age range

[9]. The sub-matter of factors that affecting reaction rate is the matter that should be presented to students who are at the formal operating stage ie 11 years and over. This is in accordance with this research conducted in class XI IPA 1 SMA Negeri 1 Cerme, the majority of students aged 16 years and over. This is the right age in which students are able to think abstractly and are logical. In this research, students are able to think of problems that are solved with certain stages of problem identification to make conclusions that require logical thinking to solve it.

Students' Activities

The result of the observation of students' activity in three meetings can be seen as follows.



Picture 2 Students Activities Per Meeting

Each component of the students's activity is corresponds with critical thinking skills and deep dialogue and critical thinking methods. Activity components that include activities of critical thinking skills are interpretations when students identify the phenomena listed in the LAU [3]. Inference when students formulate hypotheses that exist in the LAU and students make a conclusion. Analysis occurs when students do experiments, students record experimental results, students dialogue with other students in analyzing experimental data, students explain experimental data, students dialogue to answer questions in data analysis. Evaluation occurs when students dialogue with other students to connect between hypotheses with conclusions.

Activity component includes deep dialogue and critical thinking method (DDCT) that students read the phenomenon contained in LAU, students write individual ideas on LAU, students explain their ideas to other students, students exchange ideas owned, participants

students educate ideas to get the right idea, students find ideas that are considered true of dialogue with other students, students dialogue with other students in analyzing variables, students dialogue with other students in making experimental procedures, students dialogue with other students in analyzing experimental data, students engage in dialogue with other students by answering questions in data analysis, and students have a dialogue with other students to corresponds between hypotheses and conclusions.

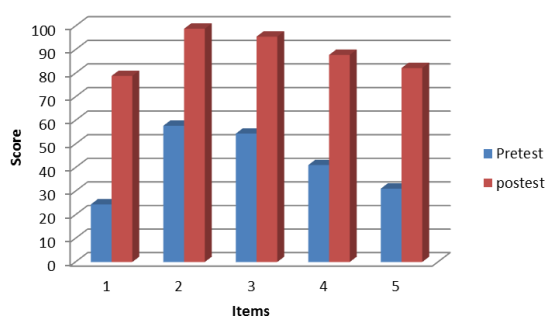
The result of the students's activity has increased or decreased in each meeting.

Students' activities on learning with guided inquiry learning model with deep dialogue and critical thinking methods on submatter factors that affecting reactin rate is very well as evidenced by the observation activity of students that the relevant activities more than 61% ie amounted to 99.57 % and irrelevant by 0.43% (relevant activity> irrelevant activity).

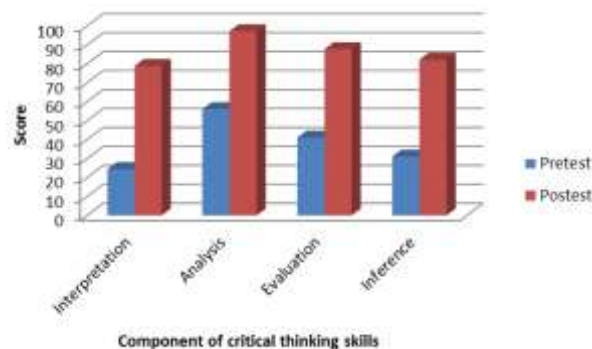
Learning theory that supports the students' activities is Piaget cognitive theory, that is in high school students class XI is at the formal operating stage is 11 years to over [9]. Students are able to think abstractly and logical. Students are able to express their opinions about the matter either with other students or with the teacher in detail on the learning activities that is when students dialogue with students to get the right idea and when students deliver answers to analysis of data questions that have been answered to classmates .

Critical Thinking Skills

Critical thinking skills that use in this research are interpretation, analysis, evaluation and inference [3]. Assessment of critical thinking skills is assessed from the acquisition of pretest and posttest score on each students then assessed using N-Gain score [7]. The pretest and posttest values consist of 5 questions which both have the same indicator of the problem. The average pretest and posttest values of each item can be seen as follows.



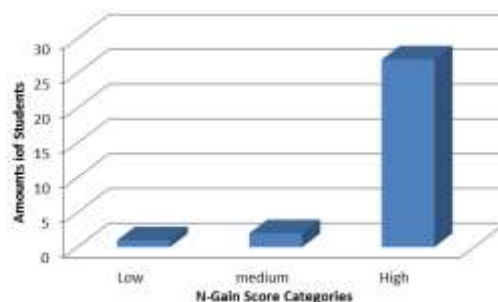
Picture 3 Pretest Posttest Score Per Item



Picture 4 Pretest Posttest Score Per component of critical thinking skills

From the Picture 3 can be seen that every item in the pretest to posttest has increased. This increase is because at the time of pretest students have not learned and understand how to think critically such as explaining phenomena, making variables, data analysis, and make conclusions. Therefore it is given instruction on submatter factors that affecting reaction rate with guided inquiry instruction model and deep dialogue and critical thinking method which is expected to be able to trill students critical thinking skill. Thoughtful thinking skills that used based on picture 4 are interpretation, analysis, evaluation, and inference.

After learning to train critical thinking skills, students are given a posttest to see the end result of critical thinking skills of students which are then analyzed using N-gain scores categorized in low, medium, and high predicates. It is said to work if accumulation of medium category and high category $\geq 61\%$. The following results from the N-Gain score of the pretest and posttest values in the class XI IPA 1 in Senior High School 1 of Cerme can be seen as follows.

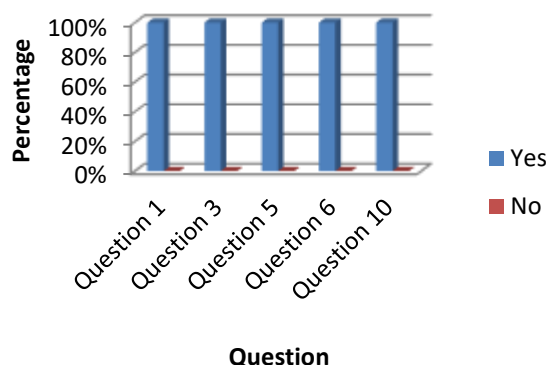


Picture 5 The Value of N-Gain Score

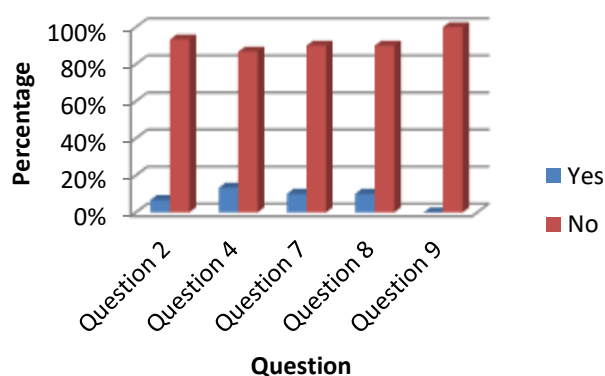
Picture 5 is the result of N-Gain score calculation of pretest and posttest value on guided inquiry model learning with deep dialogue and critical thinking method on submatter factors that affecting reaction rate. From 30 students, it can be seen that those who are in low category are only 1 child, there are 2 children medium category, and high category there are 27 children. So the accumulation of medium and high category amounted to 29 children who have a percentage of 96.67% which means very good.

Students' Response

Students' response is a response of students to implementation of guided inquiry learning model with deep dialogue and critical thinking method on the sub-matter of factors that affecting reaction rate. The response of students is measured by a questionnaire of the students' responses given at the end of the lesson through the student's response questionnaire. The response of students is positive when it reaches percentage. The results of the response of students can be seen as follows.



Picture 6 Results of Students' Response Questionnaire of Positive Question



Picture 7 Results of Students' Response Questionnaire of Positive Question

From the Picture 6 and 7 can be seen that each question on the questionnaire response students get a different percentage.

The response of students after the guided inquiry model with the method of deep dialogue and critical thinking is very good with the average percentage gain on positive question 100% and 89.75% for negative questions.

Of all the questions in the form of positive questions and negative questions, the average in the category is very good, where all students respond well to students conducted in research memalui model of learning guided inquiry with methods of deep dialogue and critical thinking on the sub-matter factors affect the reaction rate.

CLOSURE

Conclusion

The conclusions contained in this research are:

1. Learning Implementation

The implementation of learning with guided inquiry learning model with deep dialogue and critical thinking method on submatter of factors that affecting reaction rate has been done very well and in accordance with the pre-arranged lesson plan with the percentage gain in this research the first meeting gets the average of the implementation of 93% (very good), second meeting 93% (very good), and the third meeting gets an average 95% implementation which also means very good.

2. Students Activities

Students Activities on learning with guided inquiry learning model with deep dialogue and critical thinking methods on submatter of factors that affecting reaction rate took place very good as evidenced by the observation activity of students that the relevant activities more than 61% ie amounted to 99.57 % and irrelevant by 0.43% (relevant activity > irrelevant activity).

3. Critical Thinking Skills

The critical thinking skills of students increased after learning with guided inquiry learning model with deep dialogue and critical thinking method increased as evidenced by the increase of pretest to posttest value assessed with N-gain score. N-Gain score in the low category is only 1 child, there are 2 children category, and high category there are 27 children. So the accumulation of medium and high category amounted to 29 children who have a

percentage of 96.67% which means very good.

4. Students' Response

The students' response after the guided inquiry model with the method of deep dialogue and critical thinking is very good with the average percentage gain on positive question 100% and 89.75% for negative questions.

Suggestion

1. The results of this research are expected to be a reference for other researchers to conduct further research with different indicators of critical thinking skills to measure the critical thinking skills of each learner.
2. Difficulties in guided learning this study is to connect between the phenomenon with the identification of problems, teachers should be more solutive in choosing the phenomenon to match the material being taught.
3. The use of LAU in the conduct of research should be supplemented by additional questions that support information on the identification of phenomena
4. To support the Deep Dialogue and Critical Thinking (DDCT) method, special observations are required in the form of observation sheet of the Deep Dialogue and Critical Thinking (DDCT) method.
5. At the learning process should be provided LCD to support learning activities
6. When conducting the research, the number of observers should be increased
7. When doing the pretest and posttest, the learner's location should be more regulated and done individually.

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