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IMPLEMENTATION OF GUIDED INQUIRY MODEL IN REACTION RATE MATTER TO TRAIN CRITICAL THINKING SKILL

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Abstract

The purpose of the research are to know learning outcomes of critical thinking skill and students' responses to the implementation of the guided inquiry learning model. Type of research is a pre-experimental. The instruments used were implementation of learning sheet, student activity sheet, test sheet and student response questionnaire. The results showed that (1) The implementation of the guided inquiry learning model to train critical thinking skills at meetings 1 to 3 was 95.24%; 96.15% and 90.87%. (2) Individual completeness of critical thinking skills reaches 94.44% with very good predicate and 5.56% with good predicate. The critical thinking skill of the high category inference component was 97.22% and the medium category was 2.78%; the analysis component of the high category was 94.44% and the medium category was 5.56%; the high category explanation component was 55.56% and the medium category was 44.44%. (3) Positive responses of students to the guided inquiry learning model of 88.91%.

Keyword : Guided Inquiry, Critical Thinking Skill, Reaction Rate

INTRODUCTION

Education is a conscious and planned effort to create an atmosphere of learning and learning process so that students actively develop their potential to have spiritual strength, self-control, personality, intelligence, noble character, and the skills needed by themselves, society, nation and state [1].

The 2013 curriculum was developed by perfecting the mindset where changing passive learning patterns became critical [2]. Seven skills needed in the 21st century are (1) critical thinking and problem solving skills, (2) collaboration and leadership, (3) dexterity and adaptability, (4) initiative and entrepreneurial spirit, (5) able to communicate effectively both orally and written, (6) able to access and analyze information, and (7) have curiosity and imagination [3].

Critical thinking skills are the process of gaining knowledge that is interpreting, analyzing, evaluating, inferring, explaining, and self-regulation [4]. Based on the pre-research results obtained data that the analytical skills of 45%, concluded by 31% and explained by 31%, so it can be said that critical thinking education has not been properly accommodated so that the ability to think critically on students is still lacking.

Related to the aim of national education, chemistry is an important subject in the formation of attitudes and the ability to adapt in social societies. Learning chemistry learns about natural phenomena and laws, so students are expected to not only master chemistry as a product but also be able to master the scientific attitude, scientific process and application of chemistry in daily life. The emergence of these activities can be found in a number of chemical materials in schools, one of which is the rate of reaction mainly on sub-material factors that influence the rate of reaction.

Based on the pre-research results of 84% of students had difficulty in studying the material reaction rates while other students said otherwise. The learning method that applied before was teacher center. The learning method that applied before not in line with the aim of the 2013 curriculum. Based on these data, improvements are needed in learning the material reaction rates. One of the constructivism learning models that can be applied to the reaction rate matter to train students' critical thinking skills is the guided inquiry learning model. The implementation of guided inquiry learning modules is effective in improving the character of students [5].

Inquiry trains students to think critically through types of procedures to organize

knowledge and produce principles [6]. Guided inquiry brings students by being given a phenomenon of examples and connecting questions on the student worksheets as an aid to students so that students are able to formulate problems, hypotheses, process data and analyze investigations through teacher guidance.

The inquiry learning model in previous research results in an increase in value in mastering the concepts and critical thinking skills of students using the guided inquiry learning method [7]. Based on description above, the researcher intends to conduct research "Implementation of Guided Inquiry Model in Reaction Rate Matter to Train Critical Thinking Skill"

METHOD

This type of research is a pre-experimental research using the One Group Pretest Post-test Design research design as follows.

Pretest	Treatment	Post-test
O_1	X	O_2

[8]

Explanation:

O_1 = Pretest (test before implementation of guided inquiry learning)

X = Treatment (Implementation of guided inquiry learning)

O_2 = Post-test (test after implementation of guided inquiry learning)

The study was conducted in only one class without a comparison class in *SMA Negeri 2 Mojokerto* in the 2019/2020 school year with quantitative descriptive methods. The learning model used in the study is the guided inquiry learning model and the learning tools used in the syllabus, lesson plans and worksheet.

Data collection methods in this research are the observation method, the test method and the questionnaire method. The observation method is used to know the implementation of the guided inquiry learning model, to know the students activity during the implementation of the guided inquiry learning model. Test methods are used to determine the learning outcomes cognitive domain and to train students' critical thinking skills through pretest and post-test questions. The questionnaire method is used to determine students' responses during the implementation of the guided inquiry learning model.

Calculation of the percentage of implementation of guided inquiry learning models using formulas

$$\%\ \text{Implementation learning model} = \frac{\sum \text{total score}}{\text{Maximum score}} \times 100\%$$

The percentage results are interpreted into the criteria referred to in Table 1 as follows

Table 1. Criteria of implementation learning model

Percentage (%)	Criteria
0-20	Very low
21-40	Low
41-60	Medium
61-80	Good
81-100	Very good

[9]

The calculation of the percentage of student activity using the formula as follows

$$\%\ \text{Student activity} = \frac{\sum \text{frequency of activity that appear}}{\text{frequency of overall activity}} \times 100\%$$

The calculation of students' critical thinking skills is calculated using the following formula

$$\%\ \text{Score} = \frac{\sum \text{Student score}}{\text{Maximum score}} \times 100\%$$

The calculation results are interpreted into the criteria referred to in Table 2 as follows

Table 2. Conversion Value of Completeness of Knowledge and Skills

Completeness of Knowledge and Skills		
Range of Numbers	**Alphabet**	**Predicate**
86-100	A	Very good
81-85	A-	
76-80	B+	Good
71-75	B	
66-70	B-	
61-65	C+	Enough
56-60	C	
51-55	C-	
46-50	D+	Less

Completeness of Knowledge and Skills		
Range of Numbers	**Alphabet**	**Predicate**
0-45	D	

[10]

Critical thinking skills are analyzed by calculating the Gain score using the following formula

$$\text{N-gain score} = \frac{\text{Posttest score} - \text{Pretest score}}{\text{Maximum Score} - \text{Pretest score}} \text{ x } 100\%$$

The calculation results are interpreted into the criteria referred to in the following Table 3

Table 3. Criteria of *N-gain score*

Score (g)	Criteria
g≥0,7	High
0,7>g≥0,3	Medium
g<0,3	Low

[11]

Analysis of the results of students' responses was calculated using the following formula

$$\text{\% Percentage of Answer} = \frac{\sum \text{Postif response}}{\sum \text{Responden}} \text{ x } 100\%$$

RESULT AND DISCUSSION

Implementation of Learning Model

The implementation of the guided inquiry learning model was observed by 2 observers. The observer assesses the implementation of learning based on the observation sheet of learning that has been provided. Observation of the implementation of learning aims to determine the implementation of learning using the guided inquiry learning model according to Joyce. The results of the implementation of the guided inquiry learning model during the 3 meetings are summarized in Figure 1

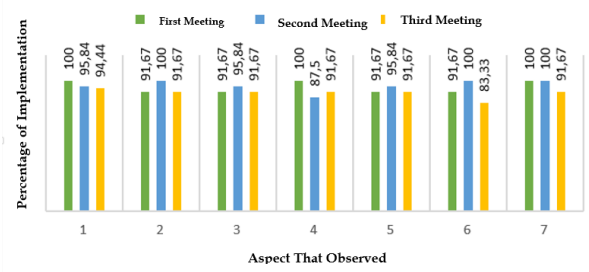

Figure 1. The Graph of The Implementation Guided Inquiry Learning Model.

Based on Figure 1, The implementation of the guided inquiry learning model during the three meetings was carried out with very good criteria as shown the percentage of average learning outcomes at first meeting until third meeting was 95.24%; 96.15% and 90.87%.

Introduction activities include opening, apperception and giving references. Apersepi is a stimulus at the beginning of learning activities that aim to focus the attention of students, increase curiosity, and motivate students to participate in learning activities. The stimulus referred to can be in the form of repetition of previous material, motivation and information or actual news [12]. The activities carried out when the apperception of the first meeting includes the teacher linking the material with students' initial knowledge of the collision theory. Percentage of introduction learning activities during three consecutive meetings by 100%; 95.84% and 94.44%.

Phase 1 is encounter with problem. The teacher in phase 1 forms a group in which one class consists of 36 students. Students are divided into 6 groups so that in 1 group consists of 6 students. First meeting discussed concentration factors matter, second meeting discussed the surface area factors and temperature factors and third meeting discussed the catalyst factors. The teacher distributes the worksheet and asks students to read the phenomena contained in the worksheet. Worksheet concentrations contain phenomena regarding crusty bathroom floors. Surface area worksheet contains frying *tempe* phenomenon with different slices, worksheet temperature contains vegetable boiling phenomenon, worksheet catalyst contains banana cooking phenomenon. Students are guided to formulate problems. The percentage of the implementation of phase 1 learning for three consecutive meetings amounted to 91.67%; 100%; 91.67%.

Phase 2 in the guided inquiry learning model is data gathering-verification. Teacher activities in phase 2 was guide students to gather information, prove the nature of the objects or phenomena that are seen [13]. Students are asked

to read textbooks or other sources that can gain knowledge about the factors that affect of reaction rate.Teacher guides students to develop a framework of thinking that is used as students' initial knowledge in developing concepts after gaining knowledge about the factors that affect the rate of reaction.

Student after preparing the framework of thinking in guiding the teacher to formulate hypotheses and communicate hypotheses that have been made with the group. The activity of formulating a hypothesis is an activity of training the critical thinking component, namely inference. Students after preparing the hypothesis are guided by the teacher to determine the experimental variables based on the phenomenon. The percentage of the feasibility of phase 2 learning for three consecutive meetings amounted to 91.67%; 95.84% and 91.67%

Phase 3 in the guided inquiry learning model is data gatering-experiments. Teacher activities in phase 3 are isolating relevant variables, simple relationship hypotheses and conducting cause-effect relationships tests [13]. Students in phase 3 conduct experiments in accordance with the trial procedures contained in the worksheet. The teacher asks students to understand the procedure of the experiment before conducting the experiment. Students take the tools and materials that have been provided in front of the whiteboard. Student then conduct experiments and write down the results of experiments in the results of observations in worksheet. The percentage of implementation of phase 3 learning for three consecutive meetings is 100%; 87.50% and 91.67%.

Phase 4 in the guided inquiry learning model is formation of explanations. The teacher's activity is guiding students to organize and formulate an explanation by connecting it with the hypothesis and the data that has been obtained after conducting an experiment [13]. Students in phase 4 are guided by the teacher to analyze the results of the experiments that have been conducted and write them in the worksheet. The critical thinking skills that are trained are analysis. Students then make a graph the relationship of the reaction rate with the concentration factor and make conclusions of the experiment with the group. The critical thinking skills component that is trained is inference. Student then communicate the results of the experiment, analyze data and provide conclusions. The percentage of the implementaion of phase 4 learning for three consecutive meetings amounted to 91.67%; 95.84% and 91.67%

Phase 5 in the guided inquiry learning model is analysis of inquiry process. The students activities in phase 5 answer the questions in the exercises and communicate them. The critical thinking skills that are trained are explanations. Student analyze the use of learning models implemented today after answering practice questions. The percentage of the implementation of learning phase 5 for three consecutive meetings amounted to 91.67%; 100%, 9167%

The closing learning activity is the teacher delivering the next material so that students are expected to prepare the material before entering class. The teacher guides the students to pray and the teacher greets the students before leaving the class. The percentage of closing learning activities for three consecutive meetings was 95.24%; 96.15%; 90.87%.

Learning outcomes of critical thinking skill

The process of critical thinking there are six main critical thinking skills, namely interpretation, inference, analysis, explanation, evaluation and self regulation [4]. There are 3 critical thinking skills that are trained in research, namely inference, analysis and explanation. Students' critical thinking skills are measured through the pretest and post-test scores. The average pretest and posttest scores of each component can be seen as follows.

Table 4. Score of Pretest and Post-test

No.	Name	Pretest	Predicate	Post-test	Predicate
1	S1	25,00	Less	79,86	Good
2	S2	29,86	Less	81,94	Very Good
3	S3	22,22	Less	81,94	Very Good
4	S4	24,31	Less	93,06	Very Good
5	S5	25,00	Less	81,94	Very Good

No.	Name	Pretest	Predicate	Post-test	Predicate
6	S6	20,14	Less	79,86	Good
7	S7	20,83	Less	81,25	Very Good
8	S8	25,00	Less	82,64	Very Good
9	S9	20,14	Less	84,03	Very Good
10	S10	22,22	Less	85,42	Very Good
11	S11	27,78	Less	86,11	Very Good
12	S12	20,14	Less	85,42	Very Good
13	S13	22,22	Less	88,89	Very Good
14	S14	25,00	Less	88,19	Very Good
15	S15	26,39	Less	90,97	Very Good
16	S16	18,06	Less	85,42	Very Good
17	S17	22,92	Less	86,11	Very Good
18	S18	27,78	Less	84,03	Very Good
19	S19	22,22	Less	82,64	Very Good
20	S20	26,39	Less	87,5	Very Good
21	S21	20,83	Less	86,11	Very Good
22	S22	34,72	Less	91,67	Very Good
23	S23	15,97	Less	81,25	Very Good
24	S24	22,22	Less	88,19	Very Good
25	S25	22,22	Less	88,89	Very Good
26	S26	31,94	Less	89,58	Very Good
27	S27	22,22	Less	84,72	Very Good
28	S28	20,14	Less	79,17	Very Good
29	S29	25,00	Less	84,03	Very Good
30	S30	26,39	Less	90,97	Very Good
31	S31	27,08	Less	86,11	Very Good
32	S32	26,39	Less	91,67	Very Good
33	S33	22,22	Less	84,03	Very Good
34	S34	22,22	Less	87,5	Very Good
35	S35	31,94	Less	95,83	Very Good
36	S36	26,39	Less	90,97	Very Good

The value of students based on the conversion of skills and knowledge shows that 94.44% of students received an excellent rating and 5.56% of students received a good rating. This shows that learning done effectively because the value of students based on the conversion value of completeness of knowledge and skills according to the 2016 Ministry of Education and Culture is included in both good and very good categories. Through teacher guidance, the results of the post-test scores of all students included in the predicate of good and very good. This shows that in practicing critical thinking skills it produces good improvement. Vygotsky's theory emphasizes that teacher guidance is needed so that students master higher cognitive skills[14].

The results of the Gain Score data are presented in the following Figure 4.

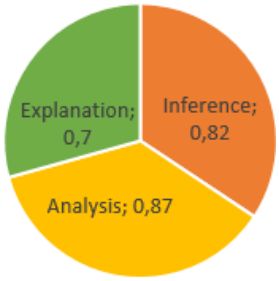

Figure 4. N-Gain Score Value for Each Critical Thinking Skill Component

The figure shows that the average N-Gain score on the inference component is 0.82 with a high category, the analysis component is 0.87 with a high category, the explanation component is 0.70 with a high category. The data shows that the application of the guided inquiry learning model is able to train students' critical thinking skills well based on the acquisition of N-gain scores included in the high category.

Students Responses

The distribution of students' questionnaires aims to find out the responses or opinions regarding learning activities using the guided inquiry learning model and student worksheets.

The average percentage of students 'responses regarding the use of inquiry learning models was 89.44% and the percentage of students' average responses regarding the student worksheets used was 88.91%. This shows that the

students gave positive responses to the guided inquiry learning model and the worksheets.

CLOSURE

Conclusion

Based on the discussion it can be concluded that

1. The implementation of the guided inquiry learning model to practice critical thinking skills at meeting 1, meeting 2 and meeting 3 in a row at 95.24%; 96.15% and 90.87%. This shows that the learning conducted during the 3 meetings went well with very good criteria.
2. Student's critical thinking skills in the inference component with N-gain values are in the high category at 97.22% and in the sufficient category at 2.78%; Students' critical thinking skills in the analysis component with N-gain values are in the high category at 94.44% and in the moderate category at 5.56%; Students' critical thinking skills in the explanation component with N-gain values are in the high category at 55.56% and in the moderate category at 44.44%. It shows that learning runs effectively because there is an increase in critical thinking skills that are measured using N-gain by achieving sufficient and high criteria. The mastery value of the students reached 94.44% of the students got a very good predicate and 5.56% of the students got a good predicate based on the conversion of the completeness of the value of knowledge and skills according to the 2016 Ministry of Education and Culture. This shows that learning runs effectively because there is an increase in critical thinking skills measured based on the conversion value of completeness of knowledge and skills according to the 2016 Minister of Education and Culture included in the category of good and very good.
3. Students' responses after applying the guided inquiry learning model to practice critical thinking skills using the worksheet of students get a positive response of 90.17%. So it can be said that learning gets a positive response from students.

Suggestion

1. Allocation of time when learning must be considered so that learning can run effectively
2. In the critical thinking skills of the explanation component, students who get an N-gain score with a very good category are fewer than the other components. The next researcher is expected to give more attention to students in working on the explanation questions so that they get the maximum value.
3. The teacher ensures that students have understood the concepts they have learned by writing them in the student worksheet.

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