THE EFFECTIVENESS OF THE GUIDED INQUIRIES LEARNING MODEL ON THE CRITICAL THINKING ABILITY OF STUDENTS

Mariya Solikah and Dian Novita[*]
Chemistry Education Study Program, FMIPA State University of Surabaya, Surabaya, Indonesia
*Email: diannovita@unesa.ac.id

Abstract: This study aims to analyze the effectiveness of the guided inquiry learning model on the student's critical thinking skills on the sub-material factors that affect the rate of reaction. The research uses a quantitative method of pre-experimental type with the one-group pretest-posttest design. The instrument used implementation observation sheets, student learning activities, skills pretest-posttest questions, cognitive pretest-posttest questions, and response questionnaires. The research showed some findings. Firstly, the guided inquiry learning model implementation at the first meeting got a percentage of 97.4%, the second meeting it was 93.4%, with a very good category. Secondly, student activities during the learning process that get a larger percentage are more relevant than those that are not relevant—thirdly, improving critical thinking skills based on the significance of 0.000 below 0.05 so that it is accepted. Fourth, the cognitive domain learning outcomes of 11th grade MIPA 4 students at SMAN 19 SURABAYA score 75, which is declared complete with an average n-gain value of 0.85 and classical completeness of 100%. Finally, student responses to the applied learning model were very good, with a percentage of 99.6%.

INTRODUCTION

Learning is defined as a conscious and planned effort that is systematically tried to gain knowledge and skills to increase their potential. They have intellectual, emotional, spiritual, and transcendental intelligence useful for people around them. [1].

One of the Natural Sciences (IPA) contents in high school is chemistry. Chemistry subjects have concepts related to understanding other concepts, which can connect several sciences, for example, physics, biology, even geology, and astronomy. Therefore, these concepts must be understood broadly and deeply [2].

Chemistry is the engineering of matter, which discusses and explores something related to the matter, such as the structure of matter, properties of matter, form of matter, transformation and interaction of matter, classification of matter, the composition of matter, and the energy that follows these changes [3].

The reaction rate is one of several materials in high school chemistry learning discussed in class XI. It explains the factors that affect reaction rates using theory collisions and design, conduct and conclude and present experimental results of factors that affect reaction rates. The concept of reaction rate is often found in many things that direct contact with us in everyday life. To observe these phenomena, in online learning, students need to directly observe practicum videos to be easier to remember, understand, and meaningful. For students to be well understood, it is necessary to have thinking skills to facilitate the delivery and acceptance of learning material in providing material.

Currently, learning is carried out with an online system (online). Teachers must create an innovative and attractive learning atmosphere as an innovation by utilizing online media (online). So that students can still get a good understanding of the material and can correlate theory with implementation in various activities in their lives. Regulation No. 69 explains that the implementation of the 2013 curriculum has the goal of changing the learning pattern from the teacher being the center of teaching and learning to be student-centered, the learning pattern from being passive to being active, the learning pattern from being individualistic to being in groups [4].

Critical thinking skills will create a person who can solve problems and make decisions through cognition [5]. The skills involved are interpretation, analysis, evaluation, inference, explanation, and self-regulation. This study uses five of the six indicators according to Facione, namely Interpretation, Inference, Explanation, Analysis, and evaluation. It is due to adjusting the syntax of the model used.

The implementation of the guided inquiry learning model has been carried out for 2 meetings and has been carried out well. The percentage of relevant student activities is greater than irrelevant student activities. Students' critical thinking skills face an increase which can be seen through the results of N-Gain with high criteria. Completeness of student learning outcomes found 100% complete learning outcomes [6]

Based on the data obtained from an interview (2021) with a chemistry teacher at SMAN 19 Surabaya, critical thinking skills have been trained but have not been fully implemented. It takes a lot of effort to bring the concepts of chemistry into the real world. Students should be able to relate their theoretical knowledge to the application of reaction rates. So it takes a lot of effort to reach 50% of the students. So far, learning on the reaction rate material is more conditioned for theoretical class discussions.

As a result, students have difficulty connecting it with everyday life. It is evidenced by the results of a student pre-study that I conducted at SMAN 19 Surabaya. As many as 28 respondents from 32 respondents stated that they found it difficult to understand the reaction rate material. A total of 30 respondents indicated that there were still many students who did not understand the four main areas of critical thinking ability, namely interpretation, inference, analysis, explanation, and evaluation. The value obtained is still relatively weak, namely the interpretation of 27%; inference 31%; analysis 21%; explanation 29%: and evaluation 25%. Based on the description above, assistance is needed to resolve the case properly in the form of treatment in education. One of the lessons that can be applied to inspire students' enthusiasm for learning in developing and improving their critical thinking skills is guided inquiry learning. In this model, the teacher guides students to be more likely to start education by providing stimulus in the form of early problems and providing directions to start a discussion. In addition, students have an orientation to focus on the guidance and instructions provided by the teacher until students can gain an understanding of lesson concepts, can solve a problem, and can conclude independently. So that it can be used in the reaction rate material where students can explain, design, perform and conclude about the factors that affect the reaction rate. This learning model is applied to make students able to think critically. Students are not only recipients of information without understanding the information. Through practicum videos, students can better understand the knowledge gained and develop their critical thinking skills. So that even during the COVID-19 pandemic, where almost all levels of education have been shifted to online and face-to-face learning, students can still obtain information on the application of the reaction rate concept in everyday life.

The application of the inquiry learning model can increase the understanding of the concept highly based on the pretest and posttest results [7]. It is evidenced through research that has been done previously that explains that guided inquiry is very effective and can train CBC. The application of learning with the guided inquiry model can increase the average value of students' cognitive learning outcomes from 51.71 to 89.71 [8]. The inquiry learning model can change the learning outcomes achieved by students optimally and get a good response from students. [9].

Applying an educational model to train students' thinking skills is necessary. Therefore, the study focuses on using Guided Inquiry Education Models on Students' Critical Thinking Ability in Factors Affecting the Reaction Rate Module at Sman 19 Surabaya Class. In addition, to obtain data that students' attitudes are relevant to the syntax of the educational model used and students have practiced CBC, it is necessary to observe student activities during the teaching and learning process. The final result of this evaluation is to obtain educational data that is considered good or not.
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RESEARCH METHOD

The study was conducted at SMA Negeri 19 Surabaya, located on Jl. Kedung Cowek No.390, Tanah Kali Kewall, Kec. Kenjeran, SBY City, East Java in the odd semester of the 2021/2022 academic year. This type of research is this type of research using a pre-experimental type through a research design "One Group Pretest-Posttest Design".

O1   X   O2

Description :

O1: The pretest aims to obtain information related to the initial ability of students' critical thinking skills

X: The treatment given is using a guided inquiry learning model on the reaction rate material to train CBC

O2: The final test (Posttest) aims to get information related to the increase in student learning outcomes, namely the critical thinking ability test on the reaction rate material after the guided inquiry learning model was applied. Researchers used only one class not accompanied by a comparison class in this study [10].

The criteria for assessing the implementation of the syntax of the guided inquiry learning model are listed in Table 1 below.

Table 1. Teacher Ability

Score	Criteria
0	Not implemented
1	Implemented but not coherently and complete completely
2	implemented but not coherent
3	Implemented coherently but incomplete
4	Implemented completely and coherently

The results of the percentage of syntax implementation assessment are then analyzed using the following formula.

% implementation of syntax =

$$= \frac{total\ score}{maximum\ score}\ x\ 100\%$$

After getting the data, the researcher then converts the data, which will later be converted into a score as follows:

1. 0%-20%   : very less
2. 21%-40%   : less
3. 41%-60%   : adequate
4. 61%-80%   : good
5. 81%-100%   : very good

[11]

The learning model implementation percentage is said to be in a good category of 61%. 2 observers observed student activities during teaching and learning activities. It was analyzed descriptively

quantitatively based on the average obtained from observations, with the following formula:
%Student activity:

$$= \frac{\sum frequency\ of\ the\ activity}{\sum Overall\ activity\ frequency}\ x\ 100\%$$

Next, determine N-Gain's value to obtain information on improving the CRITICAL THINKING ABILITY for each component after the guided inquiry learning model is applied. The determination of N-Gain is as follows:

$$G = \frac{skor\ posttest - skor\ pretest}{Skor\ maksimal - skor\ pretest}\ x\ 100\%$$

The N-Gain results obtained are classified in the categories in Table 2 below.

Table 2 Criteria N-Gain

Score	Criteria
G>0,7	High
0,3 <G<0,7	Medium
G<0,3	Low

After being given treatment for cognitive conflict strategy remedial learning, critical thinking skills that occur in students are tested using the paired sample t-test or paired t-test after the normality test was performed. The normality test was used to see if the data received had a normal distribution or not, while the paired t-test was used to see if the average change of two samples was related. The formulation of the paired t-test hypothesis:
Ho = there is no change or difference in the average between learning outcomes before and after learning critical thinking skills remedial strategies
Ha = there is a change or difference in average learning outcomes before and after learning critical thinking skills.
Ha is accepted if the level of significance/Sig. (2-tailed) < 0.05, but if the level of significance / Sig. (2-tailed) > 0.05 so Ha is rejected, so Ho is accepted Ha is accepted, it is concluded that there is a change in the average learning outcomes before and after learning which shows an increase in students' critical thinking.[12].

The learning tools used include Student Worksheets, critical thinking skills, Lesson Plans, and syllabus. The instruments used were observation sheets of learning implementation, Student Worksheets, critical thinking skills, student activity observation sheets, and pretest and posttest questions.

RESULTS AND DISCUSSION
This research was conducted for 2 online and offline meetings at SMA Negeri 19 Surabaya using the goggle meet platform, google classroom, and Whatsapp group. The research data obtained by the researchers are the implementation of the guided inquiry learning model, student activities during the teaching and learning process, critical thinking skills, cognitive learning outcomes, and student responses after learning activities.

Implementation of the Guided Inquiry Learning Model
This observation is intended to measure the implementation of the syntax of the guided inquiry learning model adapted to the lesson plans that has been prepared. Learning activities are carried out online with the Google Meet application and face-to-face at school. For face-to-face, there are 16 students, and for online, there are 16 students.

The implementation of the syntax of the Guided Inquiry learning model can be known through observations using the observation sheet on the implementation of learning that has passed the review and validation stage by the chemistry lecturer. The implementation sheet for the syntax of this learning model was given to 3 observers, namely a chemistry teacher at SMAN 19 Surabaya and 2 chemistry students in the seventh semester.

The syntax of the guided inquiry learning model is (1) problem confrontation; (2) data collection and verification; (3) experimental data collection; (4) organizing and formulating explanations; (5) inquiry process analysis [13].

Phase 1 or referred to as the confrontation phase with the problem. The teacher's role is to provide a presentation of the problem and explain the inquiry procedure to students. The teacher first greets and appoints one of the students present in the class to be the leader in the joint prayer, followed by conducting an examination related to student attendance directly. Next, the teacher tries to link the students' understanding and the collision theory (apperception). Then the teacher presents a phenomenon related to one of the factors that influence the reaction rate on a slide displayed on Google Meet and displayed live. Then the teacher conveys the learning objectives and explains the stages of delivering the material by applying the guided inquiry learning model.

Phase 2 is where the researcher will collect data and verify it. In this phase, the teacher gives student worksheets to students in the form of hard files for face-to-face and soft files to go online to the WA group class XI MIPA 4, then instructs students to read the instructions for use then proceed with studying it. Next, the teacher conditioned the students to formulate appropriate problem formulations, hypotheses, and variables based on the phenomena in the student worksheets with the guidance and direction of the teacher. In this phase, CBC trains on the interpretation component.

Phase 3 or the researcher phase collects trial data. In this phase, there will be orders for students to read and try to understand work procedures and continue to try to solve the problems presented in the student worksheets. Students ask the teacher if they find difficulties. Then the teacher displays the video

on the Google Meet screen and the students' pay attention to the video that is displayed with the teacher's guidance. After that, students collect and organize the data that has been obtained when viewing the experimental video, then analyze the data, and then get answers to the questions presented in the STUDENT WORKSHEETS while still receiving guidance and direction from the teacher. In this phase, critical thinking ability trains on the components of interpretation and analysis.

Phase 4 is the phase of formulating explanations and organizing. After the students saw the experimental video displayed by the teacher, the students made conclusions on the questions contained in the student worksheets with the guidance and direction of the teacher. In this phase, the critical thinking ability trains on the inference component.

Phase 5 is the researcher analyzes the inquiry process. In this phase, student representatives are asked to present the data on observing the experimental video by typing in the comment column Google Meet or turning on the audio, and other students respond. In addition, the teacher comments on the progress of the discussion and strengthen it by applying reaction rates in life, straightening things that are not right, and making conclusions from the subject matter received that day. In this phase, critical thinking ability trains on the component, namely explanation.

In the closing activity, the teacher instructs students to prepare for the next meeting, which is a continuation of the factors that affect the rate of reaction. And finally, the teacher said closing greetings through google meet and in person.
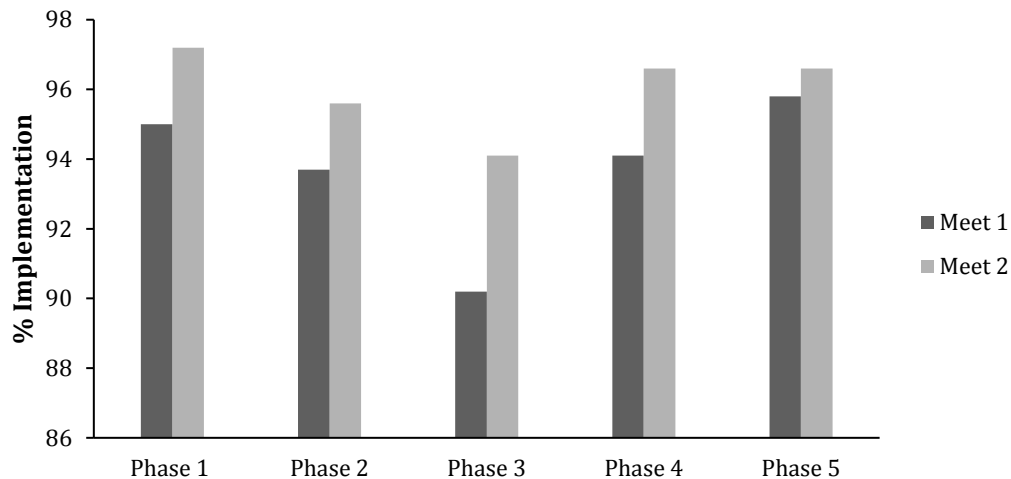

Figure 1 implementation of guided inquiry learning

Figure 1 shows that each stage at the first and second meetings obtained a percentage of implementation of 90.27%. It shows that the implementation of the guided inquiry learning model has been going well during the learning process.

Data from the implementation of the teaching and learning model of 2 consecutive are meetings 93.7% at meeting 1, and 96.8% at meeting 2. Based on the results of data analysis, teachers are considered to be able to operate the guided inquiry model in the teaching and learning process by good. A previous study showed that implementation is above 61% [7]. This study is also following previous researchers who got an increase in learning outcomes [16-19]. The level of implementation of this research is higher than the research conducted by previous researchers because there were face-to-face meetings in this study, not only online.

Student activities

Student activity observation sheets are used to record student activities during the learning process, which aims to see students' critical thinking skills during the learning process using the guided inquiry model. Student activities are conducted by observing student activities at certain minutes.

From the activities that appear, it can be seen that the learning process takes place to train critical thinking ability. Student activity was measured using the student activity sheet instrument. The results obtained are shown in Figure 2.
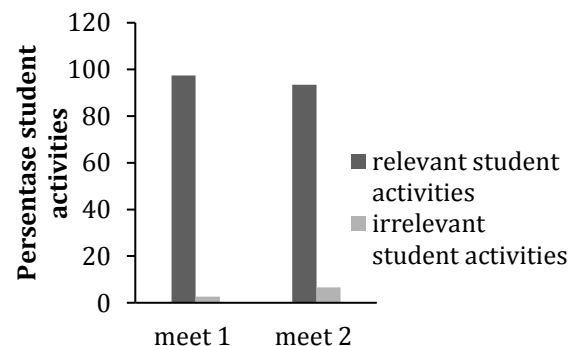

Figure 2. Student activities

Figure 2 shows that student activities are said to be carried out well and also support the effectiveness using the guided inquiry learning model. It is evidenced by the higher percentage of relevant student activities than irrelevant student activities. It shows that students can work scientifically, which requires learning chemistry in the content of the 2013 curriculum using a scientific approach by applying a discovery/inquiry-based learning model. However, in practice, we encountered problems with online learning. It was difficult to obtain detailed information on student activities. However, for face-to-face learning, detailed data can be obtained. A pretest was carried out, and then a posttest was given after being given treatment.

Critical thinking skills

This research is limited to 5 indicators: interpretation, analysis, inference, explanation, and evaluation. The pretest is given when the students have not received the teacher's learning material, while the posttest is given after the guided inquiry learning model is applied. An analysis was carried out by calculating N-Gain to obtain information on the increase in the critical thinking indicators of component students. If the N-Gain score obtained is on the medium or high criteria, the critical thinking ability is categorized as increasing. And for the overall critical thinking ability using a paired T-test.

Interpretation is the ability to transform presented information from one form to another. Students find it difficult to determine the correct formulation of the problem and the variables when doing the pretest. Students tend to make problem formulations not based on phenomena and make ordinary questions. Some students do not use the question "How" but use the question words "What" and "What". After teaching and learning activities were carried out with the application of an online-based guided inquiry learning model on the sub-material of factors that affect the rate of reaction, students' critical thinking ability on the interpretation component increased sharply. It is evident from the posttest answers students can formulate problems according to the phenomena presented, determine variables, and make tables and graphs of observations.

The inference is the ability to identify and process information to make conclusions, conjectures, and hypotheses. Students' answers on inference skills showed that they were still less thorough in answering questions during the pretest. However, after being given treatment, the student's answers to the posttest showed that they could formulate hypotheses and identify relationships from information into a relevant and logical conclusion.

Analytical skills are the skills of testing data, detecting arguments, analyzing arguments, and other forms of representation. Train students' analytical skills by practicing questions on the worksheet. When given the pretest, most of the students' answers were not comprehensive in analyzing the questions. However, after being given treatment, students can analyze the phenomena presented correctly.

Explanation is the ability of students to explain coherently reasoning about the results of their investigations and present arguments based on evidence, methodology, concepts, and context. When doing the pretest, many students have not studied reaction rate theory and its relationship with collision theory, so they do not get the maximum score on the explanation skill test. However, after being given treatment, students can write down the results of their reasoning by theories and concepts correctly.

The average value of the N-gain pretest and posttest critical thinking indicator students is presented in Figure 3.

Figure 3 indicates that students' critical thinking skills increased from pretest to posttest with high N-Gain criteria. Of the 5 components that were trained, the one that got the lowest average posttest score was the interpretation component. It happens because many students have not provided correct answers to questions that practice interpretation skills. Meanwhile, the component that gets the highest average posttest score is the evaluation component. Almost all students can give correct and appropriate answers to questions that practice evaluation skills.
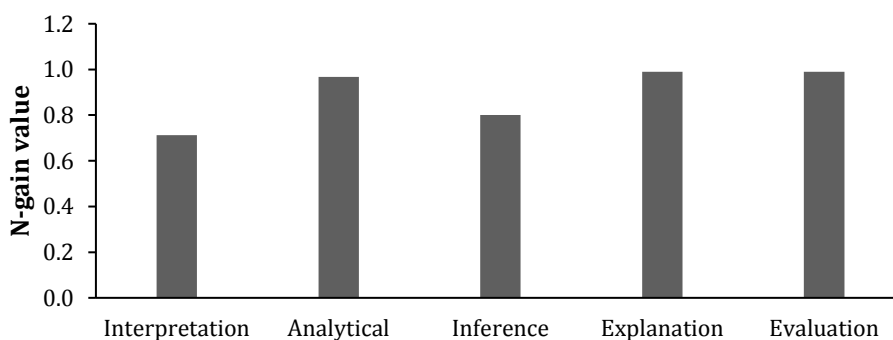

Figure 3 Average N-gain value of pretest and posttest skills

Figure 3 shows that each component increases with the average value of each component reaching above 89%. It indicates that applying the online and face-to-face guided inquiry learning model to the sub-material factors that affect the reaction rate can train students' critical thinking skills. It is in Bruner's opinion, which states that through independent efforts, students can find a solution to the problems they face to produce meaningful knowledge [1].

The shift in students' critical thinking skills was calculated using the normality test and the paired t-test. The normality test of the pretest data compared to the posttest showed that the data obtained were normally distributed. The results of the normality test can be seen in Table 3.

The T-test shows a significance value/sig. (2-tailed) of,000. In the paired t-test, hypothesis testing is carried out if the significance value / Sig. (2-tailed) > 0.05. Ha is rejected while Ho is accepted, but on the contrary, if the significance value/Sig (2-tailed) < 0.05, then Ha is accepted while Ho is rejected [15]. The resulting significant value of 0.00, which means a significant value <0.05, indicates that Ha is accepted. Ha accepted indicates a change or difference in student learning outcomes before and after the occurrence of cognitive conflict strategy remedial learning. It shows that cognitive conflict strategies can reduce students' critical thinking skills in the sub-material factors affecting the reaction rate.

The lowest average N-gain value for skills was obtained, namely interpretation, while the highest average N-gain value was analyzed. [7]. In contrast to this study, because it has student respondents with different abilities, this research student interpretation has the lowest score. It does not quite understand how to make such problem formulations and hypotheses. Those who get the highest score are evaluations because it is easy to get examples in student evaluations. factors that affect the rate of a reaction.

Paired t-test was carried out after testing the normality of the data. Based on the paired t-test, the results can be observed in table 4.

Table 3. The Results of the normality test of critical thinking skils data

		Unstandardized Residual
N		23
Normal Parameters[,b]	Mean	,0000000
	Std. Deviation	8,23618360
Most Extreme Differences	Absolute	,102
	Positive	,102
	Negative	-,094
Test Statistic		,102
Asymp. Sig. (2-tailed)		,200[c,d]

a. Test distribution is Normal.

Table 4. The Results of Paired Sampel Test

		PairedDifferences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper				
Pair 1 PRETEST - POST TEST	-71,65217	8,52061	1,77667	-75,33676	-67,96759		-40,329	22	,000

Learning outcomes in the cognitive domain. Learning

outcomes tests were carried out to obtain information about how far students' understanding and ability of the material had been given as well as supporting data in this study. In this study, the material used to measure student learning outcomes is the reaction rate material.

Learning outcomes in the cognitive domain aim to obtain information on students' abilities in mastering the material factors that affect the rate of reaction. The test is given consists of 11 multiple-choice questions. The pretest is given when students have not received the reaction rate material, while the posttest is given when students have received the reaction rate material. The two tests were carried out outside the allocation of learning time. The following is the result of the comparison of the average pretest and posttest scores 90%. It can be seen that the average n-gain of students' learning outcomes has increased significantly, which is included in the high category. The completeness of student learning outcomes is certainly supported by the implementation of the guided inquiry learning model. After learning with the guided inquiry model, the results of the posttest score increased above the

minimum completeness [7]. Students' cognitive learning outcomes increased above the minimum completeness of previous research because the method used was by the material being taught.

Student Response

The response is the opinion of students after participating in learning with the application of the guided inquiry learning model. Student responses contain student responses about the learning model and worksheets that have been applied to the material. The questionnaire is addressed to students
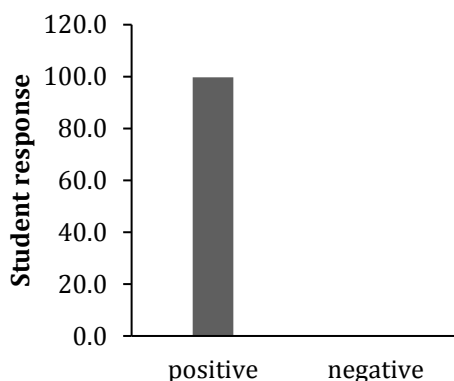

Figure 5. The average percentage of student responses

Based on Figure 5, 99.6% of students gave a positive response. It shows that the student's response is very good to the learning model applied during 2 meetings, so it can be concluded that the learning model used can be said to be appropriate. It is also supported by the results of students' critical thinking skills, which have increased as seen from the pretest and posttest scores.

CONCLUSION

The guided inquiry learning model used for 2 meetings has been carried out well. The percentage of relevant student activities is greater than irrelevant student activities. Students' critical thinking ability has increased, which can be seen through the results of N-Gain with high criteria. Completeness of student learning outcomes gets 100% complete learning outcomes. Students also gave a positive response with very good criteria. However, face-to-face meetings and online provide different observations. For face-to-face meetings, we can make maximum observations. It is recommended that all student cameras be turned on to make it easier to control their activities. Critical thinking skills on the interpretation component get the lowest results among other components. Therefore, for further researchers, more alternatives and efforts are needed to improve critical thinking skills in the interpretation component to obtain maximum results.

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at the end of the lesson, which contains questions about learning activities. The questionnaire method was used to obtain student responses or responses during 2 meetings.

There are positive answer choices "Yes" and negative "No" in the response questionnaire given to students. The learning model applied is said to be good if the percentage of student responses giving a positive response is 61%. The average percentage of student responses between positive and negative responses is presented in Figure 5.

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