Enhancing Students' Analyzing Skills on Reaction Rate Topics Using the Guided Inquiry Learning Model

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Abstract: Enhancing Students' Analyzing Skills on Reaction Rate Topics Using the Guided Inquiry Learning Model. This study aims to describe the effectiveness of the guided inquiry learning model on reaction rate material in improving analysis skills. The population in this study were all students in grade XI at SMA Negeri 13 Bandarlampung in the 2023/2024 academic year, using purposive sampling technique obtained grade XI 6 as the experimental class and grade XI 7 as the control class. This study used the matching only pretest and posttest control group design. The data obtained were analyzed by calculating the average n-gain score of the pretest and posttest analysis skills. Apart from that, hypothesis testing was also carried out using an independent t-test. The research results showed that the n-gain of analytical skills in the experimental class was in the high category, and the average posttest score for analytical skills in the experimental class was higher than in the control class. Based on the research results, it is concluded that the guided inquiry learning model on reaction rate material is effective in improving analyzing skills.

Keywords: guided inquiry learning model, reaction rate, analyzing skills.

***Abstrak: Meningkatkan Keterampilan Menganalisis Siswa pada Topik Laju Reaksi Menggunakan Model Pembelajaran Inkuiri Terbimbing.** Penelitian ini bertujuan untuk mendeskripsikan efektivitas model pembelajaran inkuiri terbimbing pada materi laju reaksi dalam meningkatkan keterampilan menganalisis. Populasi dalam penelitian ini adalah seluruh peserta didik kelas XI di SMA Negeri 13 Bandarlampung Tahun Ajaran 2023/2024, dengan menggunakan teknik purposive sampling didapatkan kelas XI 6 sebagai kelas eksperimen dan kelas XI 7 sebagai kelas kontrol. Penelitian ini menggunakan the matching only pretest and posttest control group desain. Data yang diperoleh dianalisis dengan menghitung n-gain rata-rata skor pretes dan postes keterampilan menganalisis. Di samping itu juga dilakukan pengujian hipotesis menggunakan uji-t independen. Hasil penelitian menunjukkan bahwa n-gain keterampilan menganalisis di kelas eksperimen berkategori tinggi, dan skor rata-rata postes keterampilan menganalisis di kelas eksperimen lebih tinggi dibandingkan di kelas kontrol. Berdasarkan hasil penelitian, disimpulkan bahwa model pembelajaran inkuiri terbimbing pada materi laju reaksi efektif dalam meningkatkan keterampilan menganalisis.*

***Kata kunci:** model pembelajaran inkuiri terbimbing, laju reaksi, keterampilan menganalisis*

- **INTRODUCTION**

The revised Bloom's taxonomy states that higher order thinking skills consist of analyzing, evaluating, and creating skills (Anderson & Krathwohl, 2001; Mawardi et al., 2020). Analyzing skills are a person's ability to think by describing and detailing information from a problem using reason and logical thinking to find the relationship of the information and find out how the relationship relates to the whole problem. (Anderson & Krathwohl, 2001; Marini, 2014; Wahyuni & Analita, 2017; Fadiawati & Fauzi, 2018). According to Anderson & Krathwold (2001), categories and cognitive processes of analyzing include distinguishing that is distinguishing information that is important and not important, relevant and irrelevant, and determining how the information fits into the overall structure. Furthermore, there is organizing which begins with identifying how information fits into a coherent structure and establishing systematic and coherent relationships between parts of the information presented. Finally there is attributing which ascertains the viewpoints, biases, values or intentions underlying the communication, as well as connecting one signal to another to draw conclusions. Analyzing skills are very important for students to have in solving problems appropriately (Chandra et al., 2020; Asis et al., 2021). To train analyzing skills, the learning process needs to provide space for students to solve a problem based on their own activities (Zubaidah, 2016; Nugroho, 2018).

As for the fact, students' analyzing skills in Indonesia are still not ideal. This is based on the results of a study in 2022 from the Programme for International Student Assessment (PISA) conducted by the Organization for Economic Cooperation and Development (OECD) which states that Indonesia is ranked 68 out of 81 countries (OECD, 2023). This fact is also supported by the results of research in the form of direct interviews conducted with one of the chemistry teachers at SMAN 13 Bandarlampung. It is known that chemistry learning in this school has not used the guided inquiry learning model. Learning only uses lecture methods, discussions and practice questions, and sometimes practicum is carried out based on experimental procedures in school textbooks without being asked to determine the variables involved in the practicum or analyze the data from the practicum independently. During the learning process, students tend to listen to the teacher's explanation. This causes students to be unable to solve new problems through their own learning experience.

The curriculum used in Indonesia at this time is the independent curriculum. In the independent curriculum there are learning outcomes (CP) which are competencies that must be achieved by students. So that CP becomes a reference in the learning process, CP for chemistry material consists of two elements, namely chemical understanding and process skills. The chemical understanding element covers all the material to be learned, one of which is the reaction rate, while the process skills element covers the entire scientific process that students will carry out. This process skills element includes observing, questioning and predicting, planning and conducting investigations, processing and analyzing data and information, evaluating and reflecting, and communicating results (Permendikbudristek, 2022; Kemendikbud, 2022).

Elements of process skills contained in chemistry learning outcomes, especially analyzing skills in their application require a discovery-based learning model. One of the discovery-based learning models is the guided inquiry model, in which in the learning process students experiment, collect and analyze data, formulate and evaluate hypotheses, and conclude based on their own experiences (Aini et al., 2017; Mulyana et

al., 2018; Hermansyah et al., 2019; Risna et al 2020). The learning stages of guided inquiry have a relationship with analyzing activities. In the stage of asking questions, students practice and learn the components of differentiating analysis by formulating or identifying problems. At the stage of formulating hypotheses, students are trained to connect the components of analytical relationships that arise in formulating hypotheses and determining experimental variables. At the stage of analyzing data, students are trained on the components of organizing in the form of data analysis and practice questions. At the conclusion stage, students are trained on the analysis components of attributing principles which are realized in the activity of formulating conclusions as a manifestation of material concepts in learning activities (Nurmawati & Novita, 2022).

Learning that uses the guided inquiry model makes students' analyzing skills well trained (Chandra et al., 2020; Kusmelinda et al., 2022). This is in line with Firmanda and Novita's research (2022) which mentions that guided inquiry learning has improved learning outcomes and students' analytical skills.

Based on the explanation above, it is necessary to conduct a study entitled " Enhancing Students' Analyzing Skills on Reaction Rate Topics Using the Guided Inquiry Learning Model ".

▪ METHOD

The research method used in this study was Quasy Experiments, with the research design The Matching Only Pretest and Postest Control Group Design (Fraenkel et al., 2012). The population in this study were all students of class XI IPA at SMAN 13 Bandarlampung in the academic year 2023/2024 which amounted to seven classes. The sample in this study was taken two classes from the total population, namely one class as an experimental class that used the guided inquiry learning model and one class as a control class that used conventional learning.

Sampling in this study was carried out using purposive sampling technique, namely with consideration (Fraenkel et al., 2012). The consideration is that each class has almost the same characteristics. So the XI 6 class was obtained as an experimental class and XI 7 class as a control class, this is because both classes have characteristics, namely cognitive abilities that are almost the same seen from the PTS results of students in chemistry subjects.

The types of data used in this research are main data and supporting data. The main data is in the form of analyzing skills test scores before the application of learning (pretest) and scores after the application of learning (posttest). Supporting data in the form of implementation of guided inquiry learning model and answers on student worksheets. The data sources in this study were all students in the control class and in the experimental class.

The n-gain calculation is used to see the effectiveness of the guided inquiry model in improving students' analytical skills. The amount of gain is calculated by the normalized gain formula (Hake, 1998), namely:

$$\text{n} - \text{Gain} = \frac{\%\,\text{post} - \text{test score} - \%\,\text{pretest score}}{100\,\% - \%\,\text{pretest score}}$$

Hypothesis testing carried out in this study is the two means similarity test and the two means difference test. The two means similarity test was conducted on the initial

ability (pretest score), while the two means difference test was conducted on the post-test score. This hypothesis testing was carried out by t-test using Independent sample t-test with SPSS 25.0.

Supporting data used in this research is data on the implementation of the guided inquiry learning model. Each step in guided inquiry learning will be calculated the percentage of its implementation using the following formula.

$$\% \text{ applicability of guided inquiry model} = \frac{\sum \text{scores}}{\sum \text{maximum score}} \times 100 \%$$

▪ **RESULT AND DISCUSSION**

The average pretest and posttest scores of analyzing skills can be seen in the figure below.
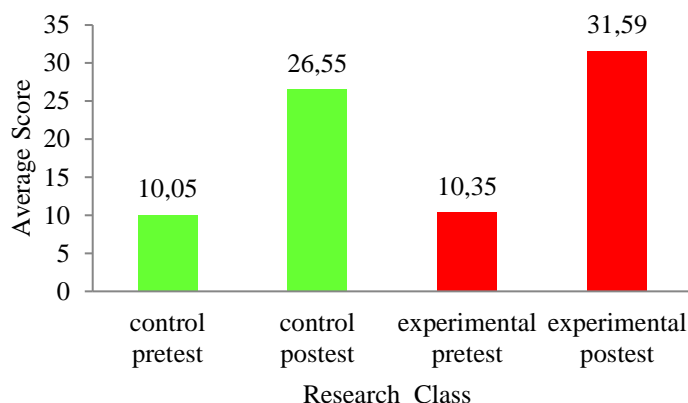
Figure 1. Average pretest and posttest scores of analyzing skills in experimental and control classes

In the figure 1, it can be seen that the average pretest score of analyzing skills in the experimental class is not much different from the average pretest score in the control class, while the average post-test score of analyzing skills in the experimental class is higher than the average post-test score of analyzing skills in the control class.

There are two hypothesis tests carried out in this study, the first is the equality test of two means on the pretest score using the t-test (independent sample t-test) using SPSS 25.0. The following are the results of the two means similarity test.

Table 1. Results of Two Mean Equality Test

Class	Independent Sample t-Test		
	Sig. (2-tailed)	Test Criteria	Description
experimental	0,846	Accept H_0 if the sig value. > 0.05 and reject H_0 if the sig value. < 0,05.	Accept H_0
Control			Accept H_0

Based on the results of the two mean equality test, it can be seen that the average pretest score of analyzing skills owned by students in the experimental class is the same as the average pretest score of analyzing skills owned by students in the control class.

Furthermore, hypothesis testing was carried out on the post-test score of analyzing skills, namely the two mean difference test. The two mean difference test was

conducted to determine whether the analyzing skills possessed by students in the experimental class who received treatment using the guided inquiry learning model were significantly different from the analyzing skills possessed by students in the control class who only used the conventional learning model. The test of the difference between the two means was also carried out with the t-test (Independent Sample t-Test) using SPSS 25.0. The following are the results of the two mean difference test.

Table 2. Results of Two Mean Equality Test

Class	*Independent Sample t-Test*		
	Sig. (2-tailed)	Test Criteria	Description
experimental	0,00	Accept H_0 if the sig value. > 0.05 and reject H_0 if the sig value. $< 0,05$.	Reject H_0
Control			Reject H_0

Based on the results of the two mean difference test, it can be seen that the average post-test score of analyzing skills owned by students in the experimental class is significantly different from the average post-test score of analyzing skills owned by students in the control class.

In addition to the pretest and posttest scores of analyzing skills, this study also obtained the average N-gain of students in both research classes. The results of the calculation of the average n-gain of students from the experimental class and control class can be seen in the following figure.
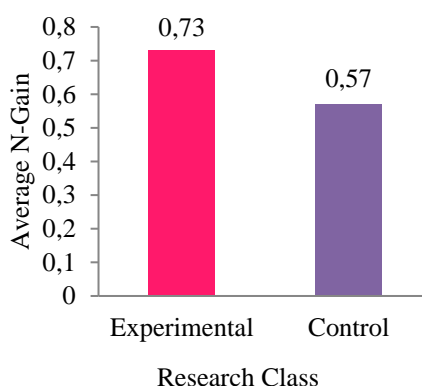
Figure 2. Average N-gain in experimental and control classes

Based on Figure 2, it can be seen that the n-gain of students' analyzing skills in the experimental class is higher than the n-gain of students' analyzing skills in the control class. The n-gain of students in the experimental class is 0.73 and is categorized as high, which means that the guided inquiry model on reaction rate material is effective in improving analyzing skills, while the n-gain in the control class is only 0.57 and is in the medium category.

Supporting data in this study are data on the implementation of the guided inquiry learning model during the learning process. The following is the data on the implementation of the guided inquiry model.
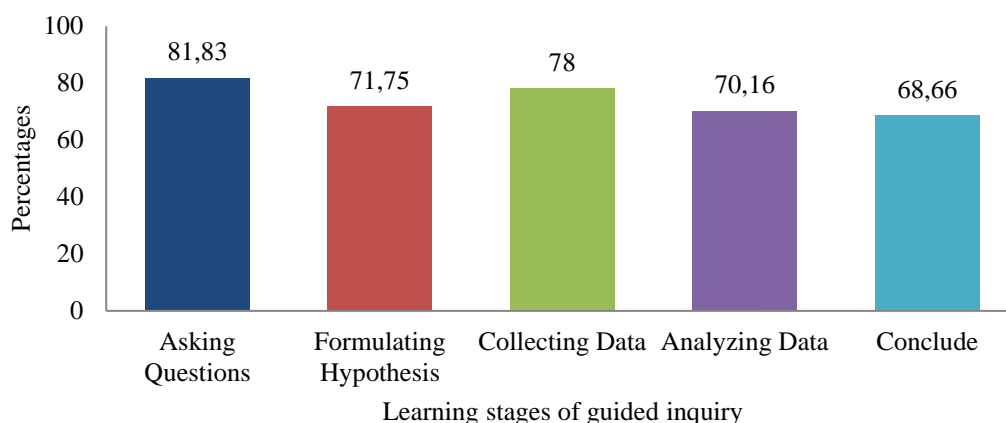
Figure 3. Percentage of implementation of guided inquiry learning model

Based on Figure 3, it can be seen that of the five stages of learning with the guided inquiry model, the highest percentage of implementation is at the stage of asking questions and the lowest percentage is at the conclusion stage. However, the stages in this guided inquiry learning already have high criteria for implementation, with the stage of asking questions having very high criteria.

Based on the research results and hypothesis testing, it is known that the average post-test score of students' analyzing skills in the experimental class is significantly different from the average post-test score of students' analyzing skills in the control class. In addition, it is also known that the average n-gain in the experimental class is in the high category. So it can be concluded that the guided inquiry learning model on reaction rate material is effective in improving analyzing skills. This is in accordance with the results of research conducted by Chandra et al., 2020; Kusmelinda et al., 2022; and Firmanda & Novita, 2022 which states that learning using the guided inquiry model makes students' analyzing skills well trained.

▪ **CONCLUSION**

Based on the results of research and discussion, it is concluded that the guided inquiry learning model on reaction rate material is effective in improving analyzing skills. This can be seen from the significant difference between the average post-test score of analyzing skills in the experimental class and the average post-test score in the control class and also obtained the average n-gain of students in the experimental class in the high category.

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