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The effectiveness of guided inquiry learning based on Anderson's sketch analysis on students' higher order thinking skills in reaction rate

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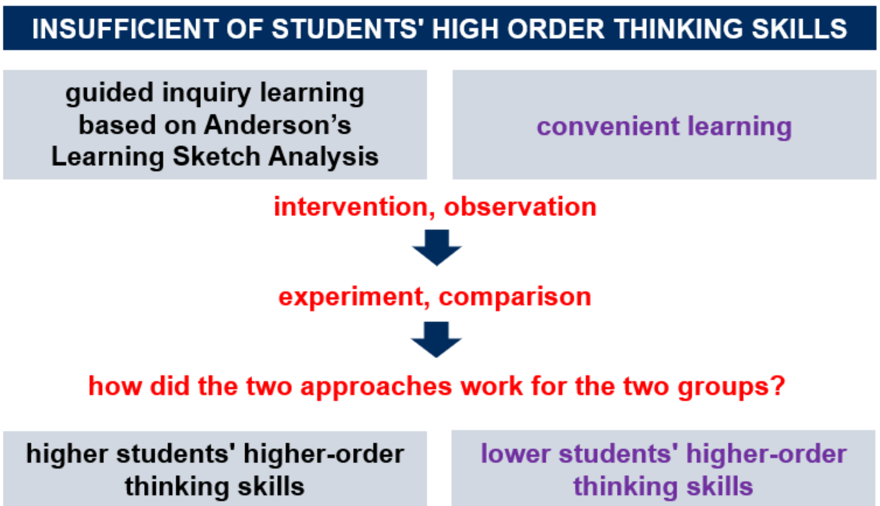
Abstract

The 21st century learning process focuses on enhancing higher-order thinking skills (HOTs). In Indonesian schools, students' HOTs in the reaction rate topic need improvement. This study investigates the effectiveness of guided inquiry learning based on Anderson's learning sketch analysis in enhancing HOTs. Involving 60 of 11th grade science students from a public high school in Malang, the study used a quasi-experimental design with an experimental class (Anderson's learning sketch) and a control class (conventional learning). The research instrument was a HOTs assessment with 10 essay questions. Data analysis using an independent sample t-test showed a significant difference ($p = 0.002$), with the experimental class scoring higher (69.3) than the control class (49.9). The findings indicate that Anderson's Learning Sketch Analysis is effective in improving students' HOTs, with the experimental class outperforming the control class in skills such as analysis (63% vs. 39%), evaluation (71% vs. 55%), and creation (78% vs. 70%). These results highlight the importance of guided inquiry in enhancing HOTs.



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Highlights

- Guided inquiry learning for promoting higher order thinking skills.
- Anderson's sketch analysis platform for measuring higher order thinking skills.
- Employing reaction rate teaching, a tool for higher order thinking skills.

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1. Introduction

The Indonesian Curriculum is designed to equip students with the competencies necessary for the demands of the 21st century, focusing on the development of 4C skills: (a) critical thinking and problem-solving, (b) communication, (c) creativity and innovation, and (d) collaboration. These skills are essential for preparing students to navigate complex, rapidly changing global environments. To achieve this, the curriculum emphasizes cultivating higher-order thinking skills (HOTs) throughout the learning process, enabling students to engage in deeper, more analytical thinking and become effective problem solvers (Kemdikbud, 2018).

Previous research has extensively explored strategies and teaching models aimed at enhancing students' higher-order thinking skills (HOTs) in chemistry education. One effective strategy for fostering HOTs is the use of guided inquiry-based learning. For instance, Mawardi *et al.* (2020) demonstrated that guided inquiry-based student worksheets significantly promote the development of HOTs. Similarly, research by Prahani *et al.* (2016) showed that the guided inquiry model is particularly effective in improving students' problem-solving abilities. This approach enables students to actively engage in the learning process through independent investigation and problem-solving, while still receiving guidance from the teacher. As a result, students are better able to grasp complex concepts and develop critical thinking skills more efficiently.

Anderson *et al*. (2001) developed a taxonomy-based learning outline consisting of knowledge and cognitive dimensions to serve as a foundational framework in the teaching process. The learning components, such as learning objectives, learning activities, and assessment, are categorized in the taxonomy table based on their knowledge and cognitive dimensions. The management of these learning components within the outline developed by Anderson is referred to as Anderson's Sketch Learning.

Anderson's Learning Sketch Analysis can be an effective tool for developing students' HOTs by focusing on the cognitive processes of analyzing (C4), evaluating (C5), and creating (C6), as outlined in the revised Bloom's Taxonomy. This approach is designed to help teachers promote HOTs during instruction by organizing learning components within the higher-order thinking categories. This structured classification enhances the learning process, ensuring that it is both targeted and effective in fostering critical thinking.

As a teaching method, Anderson's learning sketch analysis can be seamlessly integrated into various instructional models, including the guided inquiry model, to achieve more optimal learning outcomes (Anderson *et al.*, 2001). For example, Net *et al*. (2024) developed science worksheets oriented toward HOTs through inquiry-based learning, demonstrating the value of this approach. Additionally, Nzomo *et al*. (2023) used inquiry-based learning to build students' self-efficacy in chemistry, further improving their HOTs. These studies highlight the potential of combining Anderson's Learning Sketch Analysis with inquiry-based methods to support and enhance HOTs development.

The core competencies outlined in Minister of Education and Culture Regulation No. 37 of 2018 highlight that the topic of reaction rates in chemistry is one that demands HOTs. According to Habiddin and Page (2019), Indonesian students' HOTs in chemical kinetics, including reaction rates, remain underdeveloped and require improvement. However, the nature of the reaction rate topic—characterized by reasoning, laboratory work, and problem-solving—presents a significant opportunity to effectively cultivate HOTs within this area of learning.

The study titled "Development of Teaching Materials for the Reaction Rate Subject Oriented to HOTs based on Anderson's sketch analysis" by Herunata *et al.* (2021) categorizes the reaction rate topic into four subtopics: 1) the concept of reaction rate, 2) reaction order, 3) theories of reaction rate, and 4) factors affecting reaction rate. These components of reaction rate learning are then systematically organized within Anderson's learning sketch analysis framework, as detailed in **Table 1**.

Table 1. Anderson's sketch analysis for the reaction rate topic.

Knowledge dimension	Cognitive dimension					
	Remember	Understand	Apply	Analyze	Evaluate	Create
Factual knowledge						
Conceptual knowledge				Objective 1 Assessment 1 Objective 3 Activity 3 Assessment 3	Objective 2 Assessment 2	
Procedural knowledge				Activity 1	Activity 2	Objective 4 Activity 4 Assessment 4
Metacognitive knowledge						

Given the background outlined above, it is essential to investigate the effectiveness of guided inquiry learning based on Anderson's Learning Sketch Analysis in enhancing students' HOTs, specifically in the context of reaction rates. This research builds upon previous studies that assessed students' abilities after learning about reaction rates without any specific interventions. The findings from those studies identified the key aspects of HOTs that need further strengthening in the learning process.

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2. Method

This research was conducted at a public senior high school in Malang City during the first semester of the 2022/2023 academic year. The study population comprised of 11^{th} grade science students from the school. A cluster random sampling technique was employed to select the study sample. The sample consisted of two classes: 11^{th} Grade Science 3, designated as the experimental group, and 11^{th} Grade Science 2, designated as the control group.

This study utilized a quasi-experimental design. The experiment aimed to compare the HOTs of students in the experimental group, who received guided-inquiry learning based on Anderson's sketch learning analysis on the topic of reaction rates, with the control group, who underwent convenient teaching of reaction rates topic. The purpose was to assess the impact of these different teaching approaches on students' HOTs abilities. The design is:

O1 (first observation)	*X*	O2 (last observation)
O1 (first observation)		O2 (last observation)

X: Treatment: guided inquiry learning based on Anderson's sketch analysis in reaction rate topic.

Before experimenting, we performed a statistical analysis to confirm the equivalence of abilities between the students in the experimental and control groups, allowing for a direct comparison of their final capabilities. The data for this analysis were drawn from the students' report card grades from the previous semester. To assess normality, we employed the Mann-Whitney U test.

In the experimental class, we implemented a guided inquiry model integrated with Anderson's Learning Sketch Analysis approach to enhance the learning experience. In contrast, the control class utilized more conventional teaching methods. In the experimental group, learning activities focused on providing illustrations and teacher-guided questions to deepen students' understanding and foster higher-order thinking skills (HOTS), in alignment with the framework outlined in Anderson's learning sketch analysis. Meanwhile, the control class was taught without any specific interventions, relying primarily on lectures and discussions. The conventional teaching methods employed in the control group aimed to develop HOTS through a scientific approach, which is a form of guided inquiry-based learning.

The impact of the treatment in this study was evaluated using statistical tests on the assessment results of students' higher-order thinking skills (HOTs) in both classes after they completed their learning on reaction rates. The independent sample t-test was employed for this analysis, following prerequisite tests for normality and homogeneity. Additionally, the data on students' HOTs assessment results were examined both quantitatively and descriptively to provide a comprehensive overview of their abilities across each HOTs category.

For this study, we utilized an assessment instrument specifically designed to measure students' HOTs, which comprised 10 open-ended questions focused on the HOTs relevant to reaction rates. The validity of this instrument was established through evaluation by two expert validators: a chemistry lecturer and a high school chemistry teacher. The average validity percentage, as shown in **Table 2**, was an impressive 89% from both validators, confirming the instrument's appropriateness for the study following minor revisions based on their feedback.

Furthermore, the HOTs assessment instrument underwent empirical testing with grade XI science students at a senior high school in Batu City to further assess its validity and reliability. Statistical analysis of the pilot test data revealed that all items in the HOTs assessment instrument were valid, with calculated r values ranging from 0.466 to 0.804, all exceeding the critical value of 0.433. The reliability analysis produced a Cronbach's Alpha value of 0.830, indicating strong reliability for the instrument. According to established standards by George and Mallery (2016), an alpha above 0.70 is considered acceptable for social science research. Thus, the instrument exhibits a robust level of internal consistency, making it suitable for assessing HOTs in this context.

Table 2. Category of validity levels.

Percentage	Validity levels
81–100%	Very high
61–80%	High
41–60%	Moderate
21–40%	Low
0–20%	Very low

The implementation of Anderson's learning sketch analysis in this study utilized a set of teaching materials that were validated by the same experts who assessed the HOTs assessment instrument. The materials included lesson plans, student worksheets, and learning media (such as PowerPoint presentations), with four distinct sets created for each type of resource. The validation results for these teaching materials are presented in **Table 3**.

These validation results indicated a very high level of validity for the prepared teaching materials, allowing them to be used in the teaching process for this study after incorporating revisions based on the validators' feedback.

Table 3. Results of teaching materials validation.

Teaching material	Validator 1 score	Validator 2 score	Average score	Validity levels
Lesson plans	95%	90%	92%	Very high
Student worksheets	100%	95%	98%	Very high
Learning media	92%	90%	91%	Very high

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3. Results and discussion

3.1. Analysis of students' initial abilities

The students' initial abilities were assessed using data from their previous semester's reports. This data was subjected to statistical analysis to evaluate whether there were significant differences between the initial abilities of the control and experimental groups, with a significance level set at 0.05. A homogeneity test was conducted to confirm that both groups had the same variance, and the results are presented in Table 4. Following this, a normality test was performed as a prerequisite for the parametric comparison test, with the findings detailed in Table 5.

The normality test of the students' initial abilities indicated a significance value of less than 0.05, suggesting that the data is not normally distributed. Consequently, the hypothesis test to assess the significant difference in initial abilities between the two classes was conducted using a non-parametric statistical test, specifically the Mann-Whitney test. The null hypothesis for this comparison posits that there is no significant difference in the initial abilities of the experimental and control classes, while the alternative hypothesis proposes that a substantial difference exists. The results of the Mann-Whitney test are summarized in Table 6.

The Mann-Whitney test yielded a significance value greater than 0.05, leading to the acceptance of the null hypothesis and the rejection of the alternative hypothesis. This indicates that there is no significant difference between the initial abilities of the experimental and control classes. Consequently, the two classes can be directly compared in this study, as their initial skills are considered equivalent.

3.2. Analysis of students' higher-order thinking skills

The higher-order thinking skills (HOTS) of students were assessed based on the results from the HOTS assessments conducted after the completion of the reaction rate learning module in both classes. This data underwent statistical analysis to determine if there was a significant difference in HOTS abilities between the control and experimental groups, with a significance level set at 0.05. The homogeneity test for the HOTS ability data is presented in Table 7, confirming that both sample groups exhibit the same variance. Following this, a normality test was performed as a prerequisite for the parametric comparison, and the results are detailed in Table 8.

A normality test on the students' HOTs ability data yielded a significance value greater than 0.05, indicating that the data is normally distributed. As a result, a parametric statistical test, specifically the independent samples t-test, can be used to assess whether there is a significant difference in HOTs abilities between the two classes. The null hypothesis (H_0) for this test posits that there is no significant difference in HOTs abilities between the experimental and control groups. Conversely, the alternative hypothesis (H_1) suggests that a significant difference exists between these two groups. The outcomes of the independent samples t-test are displayed in Table 9.

The independent samples t-test produced a significance value below 0.05, leading to the rejection of the null hypothesis and acceptance of the alternative hypothesis. This result indicates a significant difference in HOTs abilities between the experimental and control classes, with the experimental class achieving higher average HOTs scores. Therefore, it can be concluded that Anderson's Learning Sketch Analysis effectively enhances students' higher-order thinking skills in the context of reaction rates. Additionally, students' HOTs assessment data were analyzed both quantitatively and descriptively to provide insights into their performance in each higher-order thinking category. The average percentage of correct answers for the experimental and control classes in each HOTs category is presented in Table 10.

Table 4. Homogeneity test results of student's initial abilities data (Levene test).

Class	Average score	Sig. value	Homogeneity
Experimental	84	0.566	Homogeneous
Control	83		

Table 5. Normality test results of student's initial abilities data (Mann-Whitney U test).

Class	Average score	Sig. value	Normality
Experimental	84	0.015	Not normal
Control	83	0.000	Not normal

Table 6. Mann-Whitney test results of student's initial abilities data.

Class	Average score	Sig. value	Conclusion
Experimental	84	0.634	H_0 is accepted
Control	83		

Table 7. Homogeneity test results of students' HOTs abilities data.

Class	Average score	Sig. value	Homogeneity
Experimental	68.3	0.730	Homogeneous
Control	49.9		

Table 8. Normality test results of students' HOTs abilities data.

Class	Average score	Sig. value	Normality
Experimental	68.3	0.126	Normal
Control	49.9	0.117	Normal

Table 9. Independent sample t-test results of students' HOTs abilities data.

Class	Average score	Sig. value	Conclusion
Experimental	68.3	0.002	H_0 is rejected
Control	49.9		

Table 10. The average percentage of correct student responses in each HOTs skill.

Class	HOTs category		
	Analyzing (C4)	Evaluating (C5)	Creating (C6)
Experimental	63%	71%	78%
Control	39%	55%	70%

3.3. Students' higher-order thinking skills in the analyzing skill

In the students' HOTs assessment instrument, five questions were categorized as involving the ability to analyze. The percentage of correct answers from the control class students and the experimental class students for the questions tagged as studying (C4) are presented in Table 11.

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Table 11. Percentage of correct answers in the analyzing skill (C4).

Question number	Main topic	Question indicator	%Correct answers	
			Control class	Experimental class
1	Concept of reaction rate	Given data on time and moles of reactants in a chemical reaction, students can calculate the time needed to obtain a certain amount of reaction products by analyzing the rate comparison between substances in the given response.	17	45
2	Theories of reaction rate	Given illustrations of two different experiments based on submicroscopic representation, students can analyze the factors affecting the occurrence of a reaction.	52	75
5	Factors affecting reaction rate	Given experimental data for the reaction between $Na_2S_2O_3$ and HCl under various conditions, students can predict the reaction rate order of several provided responses.	62	78
9	Reaction order and rate equation	Given various information about the effect of changing reactant concentrations on reaction rate and the rate constant value at a specific reactant concentration, students can determine the rate constant by analyzing the provided information.	31	47
10	Reaction order and rate equation	Given submicroscopic illustrations of several experiments with different numbers of reactant molecules along with their rate equations, students can identify correct statements about the reaction rate.	34	68
		AVERAGE	39	63

The results of the HOTs assessment show that students in the experimental class, who learned the reaction rate material through Anderson's learning sketch analysis, demonstrated stronger analytical skills than those in the control class, who were taught using traditional methods. This is evident from the higher percentage of correct answers in the experimental class compared to the control class across the five questions in the "analyzing" category. Specifically, the experimental class achieved an average of 63% correct answers, while the control class averaged 39%. An example question used to assess students' analytical HOTs abilities is provided below.

Question 9. The reaction experiment A B C produces the following data:

- When the concentration of B remains constant, and the concentration of A has increased two times the original rate, the reaction rate becomes four times faster
- When the concentration of A remains the same, and the concentration of BA is increased two times the original rate, the reaction rate becomes two times faster
- When [A]=2M and [B]=3M the reaction rate is 0.24 Ms^{-1}

Based on these data, the reaction rate constant is...

Question 9 serves as an example of an "analyzing" category question, specifically under the subcategory of attributing. In this question, students are asked to analyze the purpose and meaning of given data or statements and apply their analysis to solve a problem. Statements 1 and 2 provide clues about the order values of each reactant, requiring students to understand how changes in reactant order values affect the reaction rate. By attributing the information in these statements, students can determine the reactant order values and use them to infer the reaction's rate equation. Statement 3 then guides students to calculate the rate constant using the provided data and the derived rate equation. Sample student responses to Question 9 from both the experimental and control classes are shown in Figs. 1 and 2.

The student response from the experimental class demonstrates strong analytical skills. The student effectively interpreted the meaning of each provided data point and statement to solve the problem accurately. In analyzing statements 1 and 2, the student correctly identified the order values of each reactant and supported their conclusions with logical reasoning. For statement 3, the student skillfully applied mathematical calculations to determine the rate constant, using the given concentration and rate data, along with the reactant order values derived from the earlier analysis.

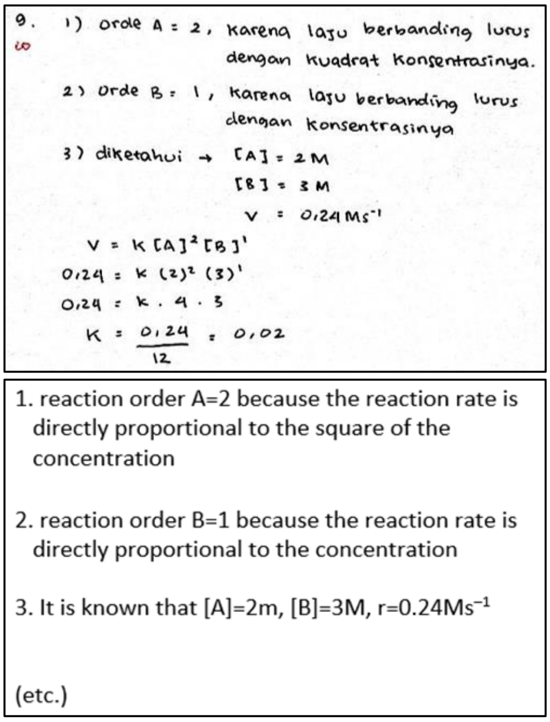

Figure 1. An example answer from the experimental class student for analyzing category questions.

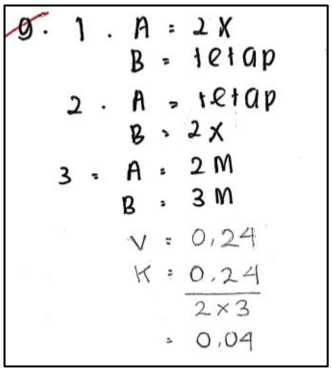

Figure 2. An example answer from a control class student for analyzing category questions.

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The student from the control class demonstrates a need for stronger analytical skills. He struggled to accurately analyze statements 1 and 2, which discussed the importance of order values concerning reaction rates, preventing him from determining the correct order of each reactant. When addressing statement 3, he attempted to calculate the rate constant using the provided concentration and rate data. However, his calculations were inaccurate due to insufficient information about the order values of the reactants, which should have been derived from the previous statements.

3.4. Student's higher-order thinking skills in the evaluating category

Three questions involve evaluating abilities in the instrument used to measure students' HOTs. The percentage of correct answers from the control class students and the experimental class students for the questions in the evaluating category (C5) is presented in **Table 12**.

Table 12. Percentage of correct answers in the evaluating category (C5).

Question Number	Main Topic	Question Indicator	%Correct Answers	
			Control Class	Experimental Class
4	Factors affecting reaction rate	Given an illustration of a reaction experiment between $CaCO_3$ and HCl, students can examine the correctness of the steps taken to increase the reaction rate.	63	81
6	Factors affecting reaction rate	Given an illustration of a reaction with a catalyst, students can examine the correctness of several statements regarding the influence of adding a catalyst on reaction products.	46	70
8	Reaction order and rate equation	Given various data on reactant concentrations and reaction rates of a chemical reaction, along with statements about the effect of changing reactant concentrations on the reaction rate, students can examine the correctness of the given words.	55	63
		AVERAGE	**39**	**55**

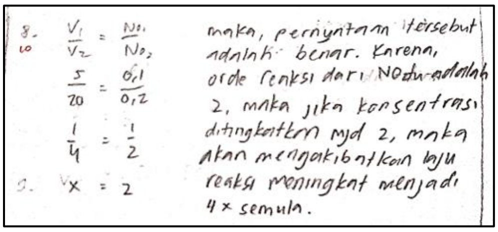
The results of the HOTs assessment indicate that students in the experimental class, taught reaction rate material using Anderson's Learning Sketch Analysis, demonstrated stronger evaluation skills than those in the control class, who were taught using traditional methods. This is evident from the higher percentage of correct answers in the experimental class across all three evaluation-focused questions. The experimental class achieved an average of 71% correct answers in this category, compared to 55% in the control class. Below is an example question used to assess students' evaluation abilities within HOTs:

> **Question 8.** The reaction of nitrogen monoxide and hydrogen gas at 1280 °C which produces products in the form of nitrogen gas and water can be written as the reaction:
>
> $2NO_{(g)} + 2H_{2(g)} \rightarrow N_{(2)g)} + 2H_2O_{(g)}$
>
> The experimental data obtained is as follows
>
> "Changing the concentration of nitrogen monoxide gas to 2 times the original with a constant concentration of hydrogen gas causes the reaction rate to increase 4 times the original".
>
> Is this statement true? Explain your reasons and prove it with calculations!

Question 8 is an example of an evaluation question under the subcategory of "checking." This question asks students to assess the accuracy of a conclusion or statement based on the given data. Students have two approaches to evaluate the validity of the information. The first approach requires calculating the order of NO gas from the data and determining its impact on the reaction rate to assess the accuracy of the statement. The second approach involves analyzing how changes in NO gas concentration, while keeping H_2 concentration constant, affect the reaction rate, then concluding the accuracy of the statement. Sample student responses for Question 8 from both classes are shown in **Figs. 3** and **4**.

Based on the answer provided (**Figs. 3**), a student from the experimental class demonstrated strong evaluation skills. The student accurately assessed the given statement by first calculating the order of the NO reactant through careful data analysis. By comparing two data points with the same H_2 concentration, the student was able to deduce the effect of varying NO concentrations on the reaction rate. Finally, the student evaluated the accuracy of the statement and provided a well-reasoned explanation for their conclusion

Based on the provided answer (**Fig. 4**), a student from the control class still needs to develop strong evaluation skills. While the students correctly calculated the order of NO from the data, they struggled to interpret its significance about the effect of concentration changes on the reaction rate. As a result, their evaluation of the given statement was inaccurate. Additionally, the student unnecessarily calculated the order of H_2, which was not required to answer the question.



Then the statement is true. because the reaction order of NO is 2, if the concentration is increased to 2 it will result in the reaction rate increasing to 4 times the original.

Figure 3. An example answer from the experimental class student for evaluating category questions.

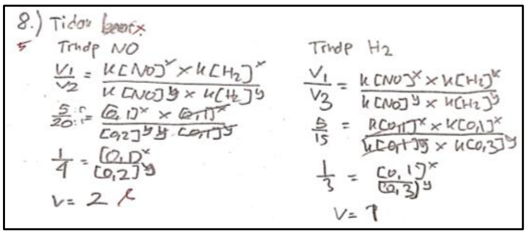


Figure 4. An example answer from a control class student for evaluating category questions.

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3.5. Students' higher-order thinking skills in the creating category

In the instrument used to measure students' higher-order thinking skills (HOTs), two questions involve the ability to create. The percentage of correct answers from the control class students and the experimental class students for questions in the creating category (C6) is presented in **Table 13**.

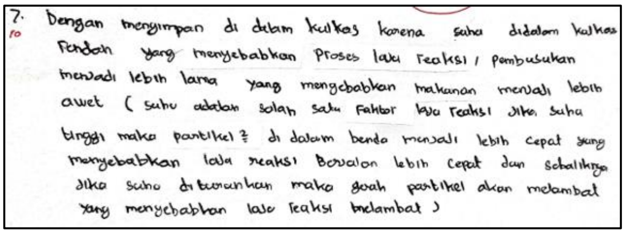
The results of the HOTs assessment show that students in the experimental class taught reaction rate concepts using Anderson's learning sketch analysis, demonstrated stronger creative abilities compared to those in the control class, who were taught using traditional methods. This is evident from the higher percentage of correct answers in the experimental class on the two questions in the "creating" category. The experimental class achieved an average of 78% correct answers, while the control class scored 70%. Below is an example of a question used to assess students' HOTs in the creating category.

> **Question 7.** According to alodokter.com, in general, food can become rotten due to the activity of putrefactive bacteria, which can release chemicals and damage the structure of the food, resulting in changes in the aroma, appearance, and taste of the food. If it is related to factors that can influence the reaction rate, provide suggestions on how to store food so that it does not spoil quickly and the reasons.

Question 7 is an example of a task within the "creating" category, specifically under the subcategory of "planning." This question asks students to devise a strategy or method for solving a problem using the information provided. The informational text explains that a chemical change occurs as food decays. Therefore, to address the problem of food decay, the proposed strategy should focus on ways to reduce reaction rates. Students can apply their understanding of factors that influence reaction rates to suggest methods for slowing food decay. Examples of student responses to Question 7 from different classes are shown in **Figs. 5** and **6**.

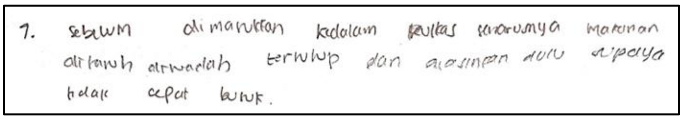
Table 13. Percentage of correct answers in the creating category (C6).

Question Number	Main Topic	Question Indicator	%Correct Answers	
			Control Class	Experimental Class
3	Factors affecting reaction rate	Given illustrations of various experiments with information on the form of substances, solution concentrations, and temperatures, students can determine experimental procedures that yield conclusions about the influence of temperature on reaction rate.	55	63
7	Factors affecting reaction rate	Given information about food spoilage causes, students can suggest ideas for quickly preserving certain foods from spoiling by utilizing factors affecting reaction rate.	85	93
		AVERAGE	**56.5**	**76**



Storing it in the refrigerator because the temperature in the refrigerator is low causes the decay reaction rate to take longer so that the food lasts longer (the reason is that temperature is one of the reaction rate factors. If the temperature is high, then the particles in the substance move faster, and conversely, if the temperature is low/lowered, then the particle movement will slow down, which causes the reaction rate to be slower)

Figure 5. Example answers from the experimental class student for creating category questions.



Before putting the food in the refrigerator, the food should be put in a closed container and stored first so that it doesn't rot quickly.

Figure 6. Example answer from control class student for creating category questions.

Based on the provided answer (**Fig. 5**), a student from the experimental class has demonstrated good creative abilities. This student suggested a solution focused on the temperature factor's influence on reaction rates. The student proposed a strategy to prevent food decay, which involves storing food in the refrigerator. Additionally, the student provided reasons for the proposed method by explaining the effect of temperature changes on reaction rates.

Based on the response provided (**Fig. 6**), a student from the control class demonstrates a need for further development of creative problem-solving skills. The student proposed storing food in a covered container and acidifying it before refrigeration as a way to prevent decay. While this strategy is not entirely incorrect, it does not directly address the core of the question, which asked students to focus on factors affecting reaction rates. The student's answer lacks alignment with these factors and does not provide sufficient reasoning or explanation for the proposed method.

4. Conclusions

This study concludes that there is a significant difference in higher-order thinking skills (HOTs) between experimental and control groups. The experimental group consistently outperformed the control group, with average scores of 69.3 compared to 49.9. Across various categories of HOTs, students in the experimental group gave more accurate responses than those in the control group. The findings suggest that Anderson's learning sketch analysis is effective in enhancing students' higher-order thinking abilities in the context of reaction rates. Specifically, the experimental group demonstrated 63% proficiency in analysis skills compared to 39% in the control group, 71% proficiency in evaluation skills compared to 55%, and 78% proficiency in creation skills compared to 70%.

Authors' contribution

Conceptualization: Herunata Herunata; **Data curation:** Hayuni Retno Widarti; **Formal analysis:** Herunata Herunata; **Funding acquisition:** Not applicable; **Investigation:** Ibnatullatiefah Ibnatullatiefah; Putri Nanda Fauziah; **Methodology:** Habiddin Habiddin; **Project administration:** Ibnatullatiefah Ibnatullatiefah; Putri Nanda Fauziah; **Resources:** Not applicable; **Software:** Ibnatullatiefah Ibnatullatiefah; **Supervision:** Habiddin Habiddin; Munzil Munzil; **Validation:** Hayuni Retno Widarti; **Visualization:** Not applicable; **Writing – original draft:** Herunata Herunata; Ibnatullatiefah Ibnatullatiefah; **Writing – review & editing:** Habiddin Habiddin; Munzil Munzil.

Data availability statement

All data were acquired and analyzed in the present investigation.

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Conflict of interest

The authors declare that there is no conflict of interest.

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