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ANALYSIS OF STUDENTS CRITICAL THINKING SKILLS USING ESSAY TESTS ON TOPICS OF RATE REACTION

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Abstract: The study aims to describe the percentage of students' critical thinking skills in senior high school of grade ten SMAN 1 Payakumbuh in reaction rate topic. The type of research is descriptive quantitative, with a sample were 72 students. Samples were taken in random sampling. The instrument used was an essay test that included indicators of Ennis' critical thinking skills. The results showed that students critical thinking skills, with the highest percentage of 87.22%, were found in deciding an action. The lowest percentage was 4.81%, namely in the indicator of observing and considering observation reports. The total percentage of students' critical thinking skills in the reaction rate material, equal to 60.39%, is included in the low category.

Keywords: *Critical Thinking Skill, Essay Test, Rate Reaction*

INTRODUCTION

21st-century skills are important skills that students must master. The skills include critical thinking and problem-solving, creativity and innovation, collaboration, and communication [1]. Critical thinking is one of the important skills in the 21st century, which must be integrated into the learning process and owned by students [2]. Critical thinking skills are one of the higher-order thinking skills in the demands of the 21st century, which consist of collecting, interpreting, and analyzing activities. as well as evaluating information so that it can provide reliable and appropriate decisions [3]. In the 2013 curriculum, critical thinking skills are one of the most important learning goals, requiring students to have character [4, 5].

High cognitive aspects and reasoning abilities such as logical, analytical, and systematic thinking can be measured using essay test instruments [6]. The essay test is a test instrument in the form of essay questions that can encourage students to provide answers in the form of descriptions rather than just selecting the available answers. Essay tests can reveal students' abilities, such as giving reasons, compiling, analyzing, synthesizing, and evaluating. Therefore, some educational experts use essay tests to assess critical thinking skills and evaluate authentic ways of thinking and experiences [7].

In general, students think that chemistry is one of the sciences that is relatively difficult to learn because, in chemistry, there are complex and abstract concepts. Chemical materials have abstract and complex concepts, one of which is reaction rate [8]. Reaction orders, collision theory, reaction rate constants, and reaction equations are complex concepts in the reaction rates topic [9]. The student's critical thinking skills in chemical material and the reaction rate of the five critical thinking categories are classified in the low category [10].

After conducting interviews with a teacher at SMAN 1 (senior high school) Payakumbuh, who teaches chemistry, information was obtained that students needed help understanding reaction rate learning because there were complex concepts in the material. The number of students who scored low and under the Minimum Completeness Criteria (MCC) with a score of 80 in the reaction rate material is evidence of students' difficulties in understanding the reaction rate material. Besides that, the teacher needs to facilitate students train students' critical thinking skills in the learning process. The teacher uses a lecture-based learning model due to the large number of targets that must be completed and the time that could be more optimal so that when observed in the learning process in class, students tend to be passive and bored. In addition, the chemistry teacher has never conducted an analysis of critical thinking skills using the essay test instrument at SMAN 1 Payakumbuh. Research conducted by Surachman shows that students only obtain material solely from the teacher because the teacher uses a direct learning model. Students are less able to build their knowledge and less active in learning, so their thinking skills are not properly trained. Thinking skills and mastery of good concepts are needed to understand abstract chemistry material so that you can apply this material in everyday life [11]. This study focuses on student's critical thinking skills using an essay test instrument on reaction rate for class XI SMAN 1 Payakumbuh.

RESEARCH METHOD

This research was conducted in the odd semester of the 2022/2023 academic year at SMAN 1 (senior high school) Payakumbuh. This research uses a type of descriptive quantitative research. The research sample consisted of 72 students of class XI at SMAN 1 Payakumbuh

(West Sumatera Province). Subjects were selected through random sampling. They are collecting data by giving essays on Ennis's critical thinking skills. The essay test that five experts have validated consists of 14 essay questions on critical thinking skills on reaction rate. This critical thinking skills test instrument can already be used to measure students' critical thinking skills and is valid with a score of 93.41%. The 14 questions represent ten indicators of critical thinking skills, namely indicators of focusing questions, indicators of analyzing arguments, indicators of asking and answering questions, indicators of considering reliable sources or not, indicators of observing and considering observation reports, indicators of deducing and considering deduction results, indicators of inducing and considering the results of induction, indicators determine the results of consideration, identify terms and consider definitions, and indicators determine an action [12].

This study uses a percentage descriptive analysis technique. The data analyses in this study calculated the score obtained by the indicators, calculated the percentage of answers per indicator, and drew conclusions on the study results [13].

The stages in data processing are as follows:

1. Each student's answer sheet is given a score based on the answer key guidelines that have been made.
2. Determine the value of each student's answer that has been scored and grouped based on each indicator of critical thinking.
3. Add up the scores obtained for each student based on each indicator.
4. Determine the percentage of each indicator of students' critical thinking skills. The formula for determining the percentage value is as follows [14].

$$NP = \frac{R}{SM} \times 100\%$$

Information:

NP: The percent value sought

R: The total score of indicators of critical thinking skills

SM: Maximum score of critical thinking skills indicator

5. Determine the average value of the percentage of students' critical thinking skills in class XI MIPA SMAN 1 Payakumbuh.
6. The values obtained are converted into the category of critical thinking skills, which can be seen in Table 1.
7. Calculate each student's achievement percentage on each indicator of critical thinking based on very high, high, medium, low, and very low categories.
8. The results of this data processing are then directed at making conclusions.

Table 1. Category of the percentage of critical thinking skills[15]
9.

Achievement percentage (%)	Category
$81.25 < x \leq 100$	Very high
$71.5 < x \leq 81.25$	High
$62.5\ x \leq 71.5$	Medium
$43.75 < x \leq 62.5$	Low
$0 < x \leq 43.75$	Very low

RESULT AND DISCUSSION

Critical thinking skills were analyzed based on the results of students' answers regarding the reaction rate material. It was obtained that the level of critical thinking ability of Payakumbuh 1 Public High School students on the reaction rate material with a percentage of 60.39% was classified in the low category. Table 2 shows the achievement percentage of each indicator of students' critical thinking.

No	Indicator of critical thinking	Indicator achievement	Category
1	Focusing questions	48.26%	Low
2	Analyzing arguments	71.45%	Medium
3	Asking and answering questions	77.08%	High
4	Considering reliable sources or not	37.91%	Very low
5	Observing and considering observation reports	4.65%	Very low
6	Deducing and considering deduction results	70.14%	Medium
7	Inducing and considering the results of induction	67.01%	Medium
8	Determine the results of the consideration	68.77%	Medium
9	Identify terms and consider definitions.	69.44%	Medium
10	Determine an action	89.18%	Very high

Indicator 1: Focusing questions

The first indicator obtains results classified in the low category with a percentage of 48.26%. Identifying or formulating criteria to consider possible answers is an aspect of the assessment measured in indicators focusing on questions. Facing a problem and having a focused and directed mind can make students not think about things outside the problem[16]. In the indicator focusing on questions, there is 1 item being tested, namely question number 11.

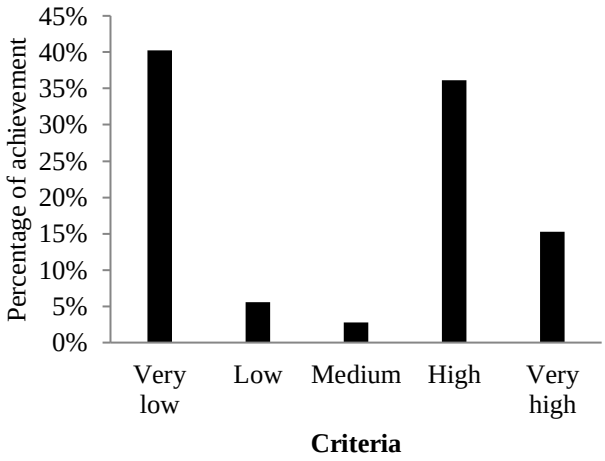

Figure 1. The level of achievement of the indicators focuses on the questions

Based on the test results, student scores are converted based on the category of critical thinking skills, where students are classified in the low category of indicators focusing on questions. The percentage of student completeness on the indicator of the effect of a catalyst on the reaction rate is low due to students' ignorance of the catalyst found in papaya leaves and students who need help understanding the concept of catalyst work in influencing reaction rates[17].

Indicator 2: Analyzing arguments

The second indicator obtains results classified in the medium category with a percentage of 71.45%. The assessment aspect that is measured on the indicators of analyzing arguments is identifying statements. A basic statement and knowledge base obtained in learning can help students give good statements. 2 items are tested on indicators of analyzing arguments, namely questions 2a and 7.

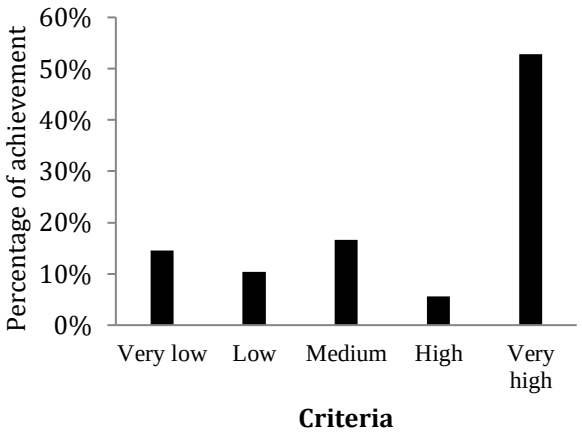

Figure 2. The level of achievement of indicators analyzes arguments

Based on the test results, students' scores were converted based on the category of critical thinking skills, where students were classified in the medium category on indicators of analyzing arguments. It is in line with Mansyur's research [18] which explains that the level of difficulty of students in the concept of reaction rate is in the moderate category of 56.76%.

Indicator 3: Asking and answering questions

The third indicator obtains results classified in the high category with a percentage of 77.08%. Providing simple explanations is an assessment aspect measured in the asking and answering questions indicator. There is 1 item tested, namely question number one.

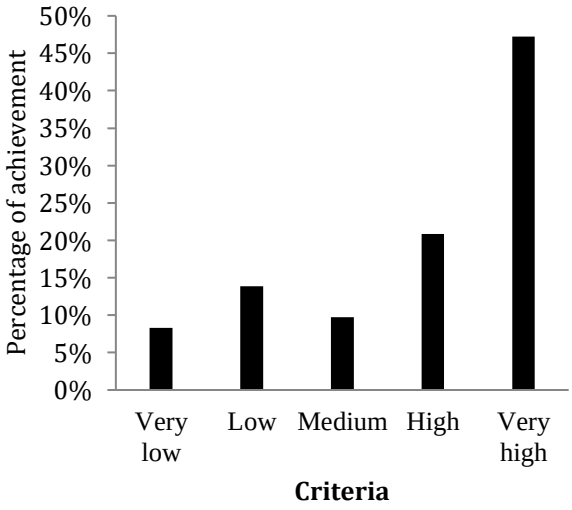

Figure 3. The level of achievement indicators asked and answered questions

Based on the test results, students' scores on indicators of asking and answering questions were converted based on the category of critical thinking skills, where students were classified in the high category. It is in line with Setianingsih's

research [10], explaining that the average score obtained in the indicators of asking and answering questions is classified in the high category with a score of 60.

Indicator 4: Considering reliable sources or not

Based on research, this fourth indicator obtains results that are classified as very low, with a percentage of 42.70%. The ability to give reasons, to consider the use of appropriate procedures and the habit of being careful are aspects of the assessment that are measured on the indicators of considering sources to be trusted or not. Four items were tested: questions number 2b, 6, 13, and 14b.

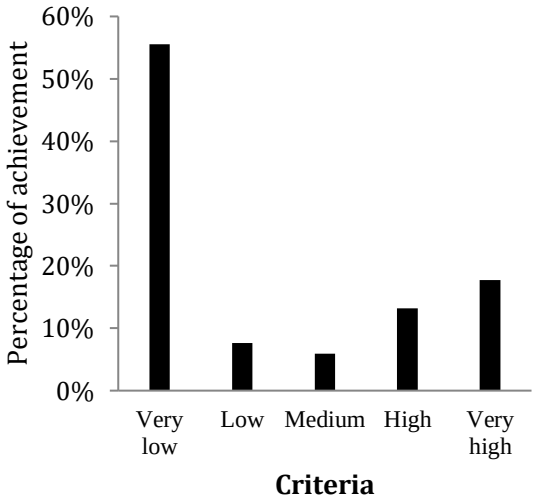

Figure 4. The achievement level of the indicator takes into account whether the source is reliable or not

Based on the test results, student scores were converted based on the category of critical thinking skills. Students were classified in the very low category of indicators considering sources to be trusted or not. The results obtained are in line with Setianingsih's research [10], explaining that indicators considering reliable sources or not belonging to the low category have an average score of 20.

Indikator 5: Observing and considering observation reports

The results of this fifth indicator are in the very low category, with a percentage of 4.81%. The aspects of the assessment that are measured against indicators observe and consider observation reports, namely using good access and the right evidence. Two items are tested on indicators of observing and considering observation reports, namely questions 12 and 14a.

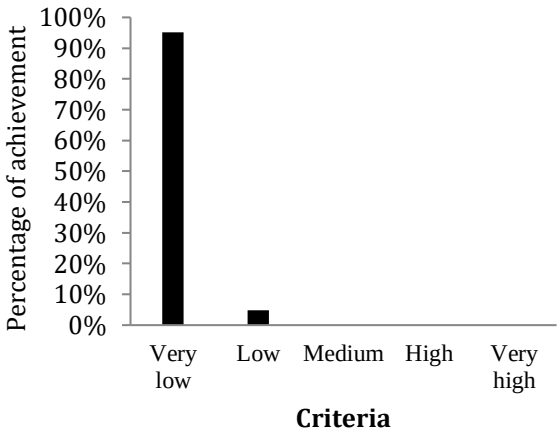

Figure 5. The level of achievement of observing and considering the observation report

After carrying out the test, student scores were converted based on the category of critical thinking skills. Students were classified in the very low category for indicators of observing and considering observation reports. It is in line with Wulansari's research explaining that the percentage of students understanding of 25.2% on the concept of reaction order and reaction rate constant is included in the very low category[9].

Indicator 6: Deducing and considering the result of the deduction

The sixth indicator obtains results classified in the medium category with a percentage of 70.14%. The aspect of the assessment measured on deducing indicators and considering the deduction results is stating the interpretation. There is 1 item tested on the indicator of deducing and considering the induction results, namely question number 9.

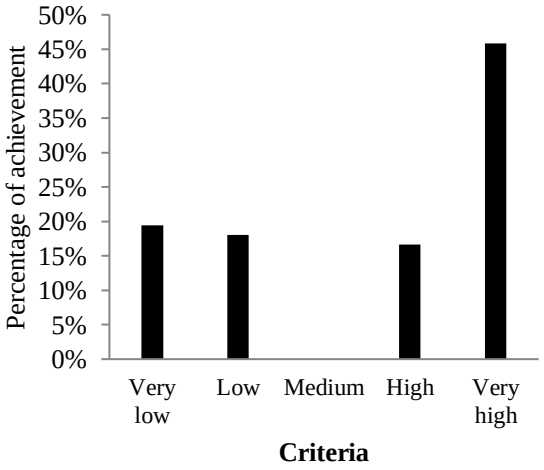

Figure 6. The level of achievement of deducing and considering the result of the deduction

After carrying out the test, students' scores were converted based on the category of critical thinking skills. Students were classified in the

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medium category for deducing indicators and considering the results of deductions. It is in line with Nazar's research which explains that in the concept of the influence of temperature on reaction rates, students experience a misconception of 57.87% [19].

Indicator 7: Inducing and considering the results of induction

The seventh indicator obtained results that are classified in the medium category with a percentage of 67%. The aspect of the assessment measured on the inducing indicators and considering the results of the induction is to conclude from the investigation results. There is 1 question item tested on the induce and consider indicator, namely question number 5b.

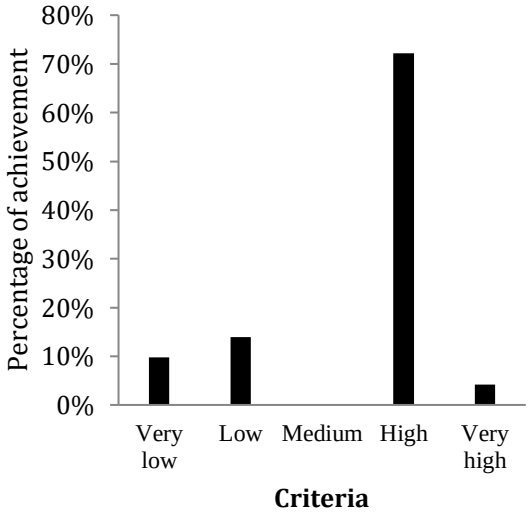

Figure 7. The level of achievement of the indicators induces and takes into account the results of the induction

Indikator 8: Determine the results of the consideration

Based on the research, this eighth indicator obtains results classified in the medium category with a percentage of 67.76%. Make and determine the results of considerations based on facts. An aspect of the assessment that is measured on the indicator determines. 2 items are tested on indicators determining the results of consideration consisting of questions 4 and 10.

After carrying out the test, student scores are converted based on the category of critical thinking skills, where students are classified in the medium category towards indicators determining a consideration. It is in line with Nugroho's research explaining that indicators determining the results of consideration obtain an average percentage score of 45.5% in the sufficient category [20].

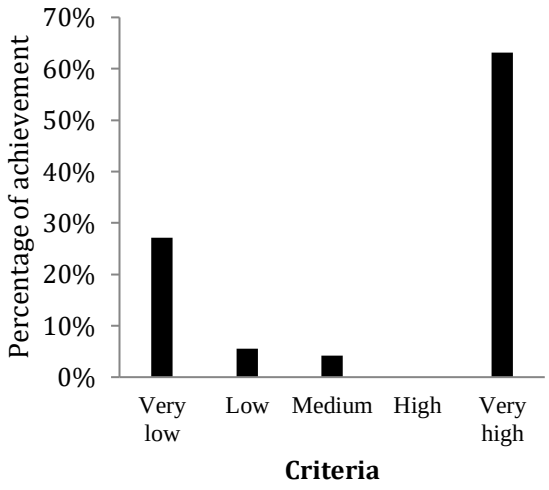

Figure 8. The level of achievement of the indicators determines the results of the consideration

Indikator 9: Identify terms and consider definitions

The ninth indicator obtains results classified in the medium category with a percentage of 69.44%. Creating a defined form is an aspect of the assessment measured in indicators of identifying terms and considering a definition. There is 1 item being tested, namely question number 3

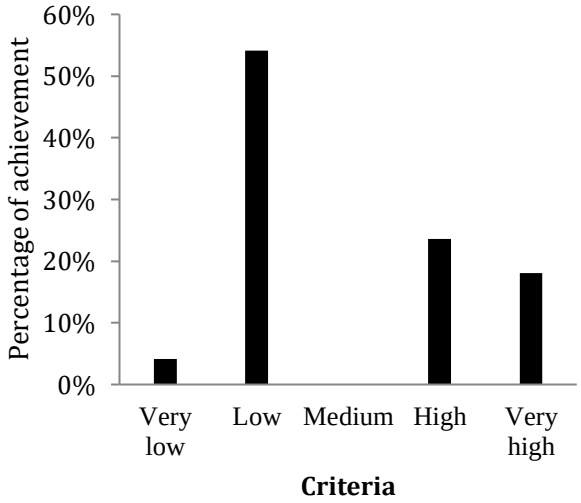

Figure 9. The level of achievement of indicators identifies terms and considers a definitions

After carrying out the test, student scores are converted based on the category of critical thinking skills. Students are classified in the moderate category based on defining terms and considering a definition. The results obtained are consistent with Lia's research explaining that indicators define terms and consider a definition

that is classified in the sufficient category with an average percentage of 42.59% [21].

Indikator 10: Determine an action

Based on the research carried out, this tenth indicator obtains results that are classified in the very high category with a percentage of 87.22%. The aspects of the assessment that are measured on the indicators determining an action are uncovering problems and formulating alternative solutions. There are two items tested on indicators that determine an action, namely questions number 5a and 8.

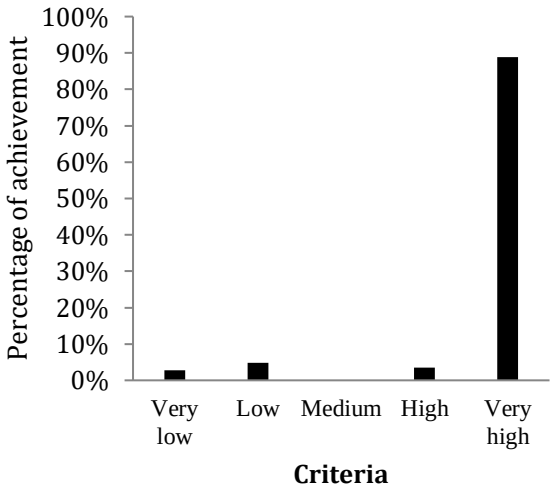

Figure 10. The level of achievement of indicators determines an action

After carrying out the test, student scores are converted based on the category of critical thinking skills. Students are classified in the very high category for indicators that determine an action. It is in line with Nugrogo's research [20], explaining that indicators determine an action with an average percentage of 81.8% in the very good category.

CONCLUSION

Students' critical thinking skills were identified in each concept in the reaction rate topic, with the highest percentage of 87.22% found in the indicator of deciding an action and the lowest percentage of 4.81% obtained by the indicator observing and considering observation reports. The total percentage of students' critical thinking skills in the reaction rate material, equal to 60.39%, is included in the low category.

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