ISSN: 2502-2318 (Online)
ISSN: 2443-2911 (Print)

Omega : Jurnal Fisika dan Pendidikan Fisika Vol **7**,No **1** (2021)

Homepage : https://journal.uhamka.ac.id/index.php/omega

Analysis of Students' Critical Thinking Ability in Answering Newton's Law Material Problems

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ABSTRACT

The purpose of this study was to determine students' critical thinking skills in answering Newton's Law physics questions in high school class X. The type of research used was descriptive quantitative research. This study systematically describes the critical thinking skills of Widya Bhakti High School Palembang students in physics subject matter of Newton's Law. The students who became the subject of this study were class X as many as 21 students. This test consists of 10 questions comprised of 5 indicators of ability consisting of the ability to analyze, evaluate, explain, infer, and interpret. Among the ten questions, there are two indicators and three indicators in 1 query. Based on data analysis of critical thinking skills on Newton's Law material for the category of indicators of ability to explain and interpret 28.57%, indicators of ability to analyze, inference, and evaluate 24.6%, indicators of ability to conception and interpret 29.16%, indicators of ability to inference 26, 19%, 0% analytical ability indicator, and 20.23% ability to explain and inference indicator. So the results of research on critical thinking skills of SMA Widya Bhakti Palembang students on Newton's Law material can be concluded that each student gets an assessment score with the highest score of 50 and the lowest score of 2.5. So students' critical thinking skills on Newton's Law material can be categorized in the low category

Keywords: Analysis, Critical Thinking, Newton's Laws

INTRODUCTION

In the world of work in the 21st century, students must have high-level thinking skills to organize their ability to solve problems by evaluating, analyzing, and creating or creating an idea, idea or concept that can build intelligent humans with high intellectuals. Because thinking at a higher level is one of the benchmarks for a person's intellectual level. Education has a significant role in the 2013 curriculum and even becomes the leading institution in preparing human resources [1].

Critical thinking is empowering cognitive skills or strategies in setting goals. The process is passed after setting goals, considering, and referring directly to the goals-a form of thinking that needs to be developed to solve problems, formulate conclusions, collect various possibilities, and make decisions when using all these skills effectively in the proper context and type [2]. Critical thinking is a systematic process used in mental activities such as problem-solving, decision making, persuading, analyzing assumptions, and conducting scientific research. And critical thinking is a person's ability to find information and solve a problem from a problem by asking himself to dig up information about the issue at hand. From several expert opinions, it can be concluded that critical thinking is a person's ability to make decisions, analyze problems and overcome the issues he faces [3]. One of the things that must be considered to produce individuals who can meet global demands is to create a generation that can think critically. Because someone who can think critically will not just believe in the facts around him without actual proof so that the points are valid and reliable [4]. In addition, critical thinking is an essential component that every student must possess, because along with the rapid development of technology and the economy,

every time a person is required to think critically, not only to accept information for granted but must be able to sort out the information he receives and look for cause and effect and the evidence logically and rationally. Therefore, instilling mathematical critical thinking skills needs to be done to overcome various problems and problems that occur in everyday life [5].

As one of the learning materials given in schools, physics has a significant role in national education goals. Physics is a branch of natural science that is studied using the senses. Physics learning always consists of two things, namely process and product. In the Regulation of the Minister of National Education No. 23 of 2006, concerning Graduation Competency Standards, it is explained that the Science and Technology subject group has the aim of developing students' logic, thinking and analytical skills. [6]. Physics is a branch of science that studies natural phenomena that are observed by the human senses. Physics contains facts, concepts, and principles based on observations about these phenomena and arranged systematically. Physics learning is ideally an activity in the classroom that can foster student interest at the beginning of learning activities. Learning activities are interactive, inspiring, fun, challenging, motivating students to participate actively, and providing sufficient space for the initiative, creativity, and independence according to students' talents, interests, and physical and psychological development [7]. Physics can develop reasoning and analysis so that almost all problems related to nature can be understood. Therefore, it is necessary to increase the mastery of concepts through meaningful learning [8].

The concept of Newton's Law is a concept that is closely related to everyday life. The concept of Newton's Law is directly associated with various natural phenomena related to everyday life. Newton's law concepts explain the position, time, velocity and acceleration. The concept of Newton's Law is crucial because it can explain natural phenomena related to motion. The concepts in Newton's laws require students to think abstractly. In addition, in understanding Newton's laws, students are expected to analyze the problems given [9]. However, in reality, students have difficulty understanding Newton's Law which results in students not solving the issues presented. Lack of understanding of concepts impacts difficulties in solving problems in Newton's law material. Students who are reliable in solving problems are students who understand the concepts that underlie the crisis. Most of the students do not have a good understanding of the concept. Students tend only to memorize the sound of Newton's laws and do not understand the physical meaning of these laws. Students only learn mathematical equations without understanding the physical importance; thus, students have difficulty imagining the forces acting on an object. Students have different concepts from the concepts of experts. This results in a lack of problem-solving skills and causes errors in Newton's law problems [9].

Physics subjects, especially Newton's Law, are often considered difficult by students because they consist of phenomena that require students to analyze, solve problems and provide solutions. Reasoning ability is needed in solving physics problems because this thinking process is used to connect known facts to a conclusion. With reasoning abilities, students are expected to understand the material well and be able to communicate and solve a problem that occurs during learning activities. Critical thinking skills are needed to be obtained from the independent learning process [10].

But in reality, according to the critics Jacqueline and Brooks (Syahbana, 2012), only a few schools accustom their students to have critical thinking. Schools lead their students to give correct answers rather than show them to issue new ideas or evaluate previous

conclusions. As the results of the research survey, according to Santoso, most schools still find that most mathematics teachers at all school levels, both at the elementary school level and the secondary school level, still apply direct learning or teacher-centred learning (Jumaisyaroh & Napitupulu, 2014). research conducted by Syahbana (Syahbana, 2012) shows that junior high school students' average critical thinking ability is still low. The average value of the essential thinking ability of junior high school students is around 68 if, on a scale of 0–100, this value is still included in the sufficient criteria [11].

From the results of initial observations at SMA Widya Bhakti Palembang, it is known that students still have difficulty in doing physics problems. So the researchers wanted to examine the critical thinking skills of Widya Bhakti Palembang High School students because most of the students working on the questions were still glued to the way that the teacher had taught. Critical thinking ability is intended so that students can develop cognitive thinking. The mental aspect is oriented to thinking skills that include more specific intellectual abilities, namely remembering, to problem solving abilities that require students to connect and combine several ideas, ideas, methods, or procedures learned to solve problems. Therefore, based on the description above, the researcher wants to conduct a study entitled "Analysis of Students' Critical Thinking Ability in Answering Physics Questions in SMA Class X".

RESEARCH METHODS

The type of research used is descriptive quantitative research. The primary purpose of descriptive research is to provide an accurate description or characteristics of a situation or phenomenon [12]. This study aims to describe or systematically describe the critical thinking skills of SMA Widya Bhakti Palembang students in physics subject matter Newton's Law. This study aims to define or systematically describe the essential skills of thinking of SMA Widya Bhakti Palembang students in physics subject matter Newton's Law. The object of the research will be taken in class X at SMA Widya Bhakti Palembang. The sample used 21 students of class X SMA Widya Bhakti Palembang. The sampling technique uses the Purposive Sampling Technique [6].

There are several data collection methods used in this research is as follows:

a. Written-test

This research develops products in the form of written test questions as a solution to the problems found [13]. Written tests are used to measure the skills, knowledge, intelligence, and abilities of students. In the context of teaching and learning, written test questions are closely related to assessment. The assessment is carried out to collect information related to students' learning progress based on the competencies that must be mastered [13]. A test is a series of questions or exercises and other tools used to measure skills, knowledge, intelligence, abilities or talents possessed by individuals or groups [14]. In this study, the written test items consisted of 10 descriptive questions used to measure students' critical thinking skills.

b. Documentations

Documentation is carried out to obtain data in the form of written evidence. The research data were a list of students' names as respondents, student test scores, photos of research implementation events, lesson plans, and students' daily scores. Also, in the technique of analyzing data using several ways.

c. Critical Thinking Ability Test Validation

A test is said to have high validity if the tool performs the measuring function correctly or provides measurement results that follow

ISSN: 2502-2318 (Online)
ISSN: 2443-2911 (Print)

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the purpose of the measurement. [15]. Validation in this study is used for test instruments that will be used in research. The validator carries out verification by testing the test instrument in terms of content and constructs.

d. Critical Thinking Ability Data Analysis

Data analysis is the decomposition or breakdown of a whole into smaller components according to the purpose of the analysis. Analysis of the data used in this study is a descriptive form of the data obtained from the results of written tests that students have completed to determine students' critical thinking skills in solving Newton's Law material problems

RESULTS AND DISCUSSION

The type of test carried out in this study was a test in the form of a description containing Newton's Law material. This research was conducted to determine the critical thinking skills of Widya Bhakti High School Palembang students. This test consists of 10 questions comprised of 5 indicators of ability consisting of the ability to analyze, evaluate, explain, infer, and interpret. Among the ten questions, there are two indicators and three indicators in 1 query. After the data is collected, the data is processed to get a score then analyzed by percentage analysis.

In this study, researchers used modified questions. After data collection is done, the data is analyzed by looking for the average value, then percentage analysis to classify students' abilities based on the assessment category. The overall description of the test result data is presented in table 1.

Table 4.1 Critical Thinking Ability Test Results Data

frekuensi	Rentang Nilai	Kriteria
0	76 – 100	Sangat Baik
0	51 – 75	Baik
9	26 – 50	Cukup
19	0 – 25	Rendah

Based on table 4.1, the essay test results with ten questions were developed according to the indicators of critical thinking skills. Each student gets an assessment score with the highest score of 50 and the lowest score of 2.5. This is shown from the value of the test results of students' critical thinking skills on Newton's Law material, namely the level of students' necessary thinking skills at an excellent grade is still not available, students who get good critical thinking ability level results also do not exist. In contrast, students who get results The fundamental level of thinking ability in the excellent category is six students. Students who get the results of the standard type of critical thinking ability are 13 students. The critical thinking ability test results on Newton's Law material show that 21 of the 21 students who took the test have a score of 75. This indicates that students' critical thinking skills are still low, especially on Newton's Law material.

In this study, critical thinking skills are categorized into five indicators. The five indicators are the ability to analyze, the ability to evaluate, the ability to explain, the ability to inference, and the ability to interpret. Where among the ten questions, there are two indicators and three indicators in 1 query. The recapitulation of the percentage analysis of students' critical thinking skills is presented in figure 1.

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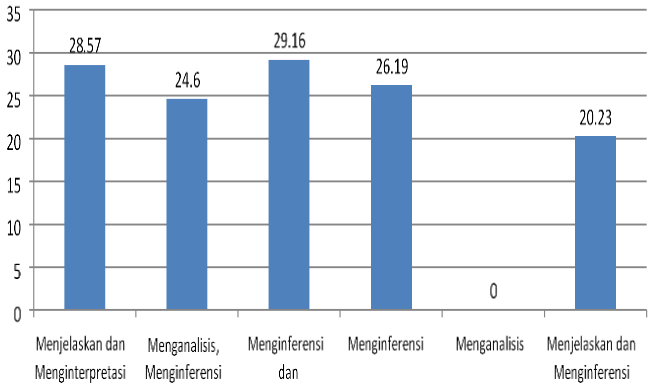

Graph 1. Critical Thinking Ability Recapitulation

There are ten description questions given to students. Of the ten questions, the percentage of students who answered correctly or close to correct was primarily found in the inference ability indicator. The fewest answered were in the analyzing indicator. The presentation of the data above shows that the most significant percentage of each indicator of critical thinking ability is 29.16% of the indicator of inference and interpretation ability and 0% of the ability to analyze.

Students' critical thinking skills in explaining and interpreting are included in the excellent category, namely 28.57%. Students can develop skills that help students state the results and concepts used when reaching conclusions.

Students' critical thinking skills on the indicators of analyzing, inferring and evaluating are included in the low category, namely 24.6%. So it can be concluded that the critical thinking ability on this indicator is in a common type.

Students' critical thinking skills on the indicators of inference and interpretation are included in the excellent category, namely 29.16%. When inferring, some students are generally able to develop skills in drawing reasonable conclusions from statements related to Newton's Laws.

The student's critical thinking ability on the inference indicator is included in the excellent category, 26.19%. When inferring, some students are generally able to identify and solve a problem so that they can draw reasonable conclusions from statements related to Newton's 3rd Law.

The student's critical thinking ability on the indicator analyzes a score of 0%, so it can be concluded that the essential thinking ability on this indicator is in a low category. When analyzing all students, it is still challenging to identify the relationship between statements, concepts, or other forms to express a reason for Newton's Law. Students are still rarely trained in analytical indicators.

Students' critical thinking skills in explaining and inferring are included in the low category, 20.25%. When presenting, students still have difficulty developing skills that help students state the results and concepts used when reaching conclusions related to Newton's Law statements.

Based on the results of research that has been done previously, it is obtained some description of critical thinking skills, namely:

(1) the ability to explain is the ability to develop skills that can help students state the results of one's reasoning, justifying reasons in terms of the concepts and methods used when reaching conclusions;

(2) The ability to analyze is to identify inference relationships between statements, questions, concepts, descriptions, or other forms of representation to express beliefs, judgments, experiences, reasons, information, and opinions;

(3) Inference ability is the ability to develop skills in drawing reasonable conclusions from data, statements, judgments, questions and concepts;

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Homepage :
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(4) The ability to interpret is the ability to develop skills in understanding and expressing the meaning of data, regulations, procedures, events and information—for example, sequences and sequences.

The low critical thinking skills of students on Newton's Law material shown in table 4.1 can be seen from the students' difficulties in completing and answering questions given in the students' critical thinking ability test instruments, including

1) students have difficulty in analyzing assumptions about gravity and gravity,

2) students have difficulty in analyzing the arguments presented by the researcher through essay questions related to Newton's Laws

3) students have difficulty defining terms and considering definitions, for example, in explaining further and identifying equations when solving problems related to Newton's Laws, and

4) students have difficulty in giving a simple explanation of Newton's Law. The same thing is also shown by several studies showing that problems, misconceptions, and lack of understanding experienced and possessed by students in Newton's Law material are indicated, one of which comes from low critical thinking skills.

CONCLUSION

Based on data analysis of critical thinking skills on Newton's Law material for the category of indicators of ability to explain and interpret 28.57%, indicators of ability to analyze, inference, and evaluate 24.6%, indicators of ability to conception and interpret 29.16%, indicators of ability to inference 26, 19%, 0% analytical ability indicator, and 20.23% ability to explain and inference indicator. So the results of research on critical thinking skills of SMA Widya Bhakti Palembang students on Newton's Law material can be concluded that each student gets an assessment score with the highest score of 50 and the lowest score of 2.5. So students' critical thinking skills on Newton's Law material can be categorized in the low category.

ACKNOWLEDGEMENT

The author would like to thank Raden Fatah State Islamic University for facilitating this research to run well.

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