

## Analysis of Students' Understanding of Concepts on Momentum and Impulse Material Using Research-Based Learning (RBL) Models

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Article Info	ABSTRACT
<p><b>Article History</b>            Received Mar 21, 2020            Revised May 17, 2020            Accepted June 18, 2020</p> <p><b>Keywords:</b>            Concept understanding            Momentum and impulse            Research-Based Learning</p> <p>To cite this article:            N. Safarati and Rahma, "Analysis of Students' Understanding of Concepts on Momentum and Impulse Material Using Research-Based Learning (RBL) Models," <i>Indones. Rev. Phys.</i>, vol. 3, no. 1, pp. 19–22, 2020.</p>	<p>This study aims to analyze students' understanding of concepts in the material of momentum and impulses using research-based learning (RBL) models. This type of research is quantitative research with a descriptive approach. The population in this study were students of class XI of SMA 3 Bireuen, the subjects in this study were students of class XI<sup>2</sup> of SMA 3 Bireuen as many as 30 students. The results of this study indicate that 30 students in class XI<sup>2</sup>. 53.3% of students in the category understood the concept, 20% students in the guessing category and 26.7% students in the don't understand the category. This shows students will better understand the concepts of momentum and impulses by using research-based learning models.</p>

### I. Introduction

Education has an important role in a nation and is demanded to be relevant to the continued development of science and technology so that through education it is expected to be able to form people who have the skills to survive in the current globalization. According to Mudyaharjo [1] education is all learning experiences that take place in all environments and throughout life. One of the goals of education is to facilitate students to reach an understanding that can be expressed verbally, in the form of numbers and positive thinking frameworks [2].

Learning that requires understanding is learning to think at a high level because in it there is a concrete thinking process, namely the ability to think spiritually, think creatively, solve problems, and make decisions. According to Alatas [3], understanding is the result of teaching and learning that has indicators and each individual can explain or define a piece of information in his own words.

According to Deviyanti [4], physics learning aims so that students can understand scientific products (concepts, laws, principles, theories) based on scientific processes, so physics learning must actively involve students to interact in the learning process, physically or mentally and not just doing activities hand-on but also mind-on. The statement above is in line with the opinion [5], the most appropriate initial step to study physics is to understand the concept first. These concepts are arranged systematically, so that mastery of concepts is needed in each material.

Mastery of concepts is a basic ability that must be possessed by students to be able to understand concepts in accordance with the understanding of scientists [6]. This is reinforced by [7] which states that the purpose of

learning is that students have good conceptual abilities so that students can develop the knowledge that students have previously had. BSPN [8] also states that mastery of good and correct concepts can improve students' intellectual abilities in solving problems related to natural phenomena.

Based on the results of research conducted by researchers at SMA Negeri 3 Bireuen, teachers in the learning process still use conventional methods and are teacher-centered. Also Besides, the demands of the institution and curriculum that requires the completeness of several some materials taught, so that the results take precedence over the learning process itself. The teacher tends to explain the material, give examples of questions and give practice questions that must be done by students, so students have accidentally been given an understanding that physics is a subject that deals only with numbers and calculations mathematically without explaining related concepts with material first.

As a result of the learning process carried out, students become passive and assume physics is a very frightening subject with a variety of formulas and numbers, so students do not understand the concepts of physics material they learn. Also besides, students are not able to connect between the material learned with a variety of knowledge and use in everyday life.

One of the materials students must master is momentum and impulses. Momentum and impulses are quantities related to the velocity and mass of an object, referring to the quantity of motion of an object and the mass of an object. The definition of momentum and impulse itself is interpreted as a quantity obtained from the multiplication between the magnitude of the velocity vector and the scalar mass of an object.

Based on these problems, RBL is a learning model that helps students to learn effectively to find meaningful physics concepts. Trinasih [9] states that research-based learning provides opportunities for students to develop contextual concepts that emphasize the real situation with the stages that must be passed by discovering new things from the process of conducting research. The RBL learning model trains students to think critically and carry out research activities (conducting traces, hypotheses, collecting data, processing data and drawing conclusions).

## II. Theory Concept Understanding

Understanding concepts is a very important aspect and must be applied in learning because with the understanding of student concepts, the ability of students to understand learning material becomes faster and more developed. According to [10], understanding is how someone distinguishes, suspects, expands, concludes, gives examples, rewrites, and estimates. Rusman [11] states that understanding is the process of individuals who receive and understand information obtained from learning obtained through attention.

According to Soedjadi [12], concepts are abstract ideas that can be used to classify or clarify a group of objects. Students who master the concepts can identify and treat new questions that are more varied. Also besides, if the child understands a concept, then students can generalize an object in various other situations that are not used in learning situations [13]. Gusniawati [14] states that understanding concepts is an ability to find abstract ideas to classify objects that are usually expressed in terms and then poured into examples and not examples so that someone can understand a concept clearly.

Based on the opinion above, it can be concluded that understanding the concept is the process by which students discover, master and understand information obtained through thinking and acting in understanding each concept of an object.

## Research-Based Learning (RBL)

The research-based learning model (RBL) is one of the new learning models that allow students to learn to build knowledge from research steps such as having to search for information, formulate hypotheses, collect data, analyze, make conclusions and prepare reports [15]. Research-based learning (RBL) is learning that builds student understanding, learning by developing prior knowledge, learning which is a process of social interaction and meaningful learning achieved through real experience. The learning process with this model requires students to be able to find, explore to face the problems faced, then test the truth of that knowledge [16].

The stages of the research-based learning (RBL) model according to [17] can be seen in Table 1.

**Table 1.** Syntax of the research-based learning model

No	Phase	Activity
1	Formulating a general Question	Provide a formula in the form of a topic or a problem in the form of a question
2	Overview of research-literature	Examining reference material from various literatures
3	Defining the question	Define question or formulate a hypothesis
4	Planning research activities, clarifying methods/methodologies	Explain, research methods /methodology
5	Undertaking investigation, analyzing data	Investigate by taking data through observation to school and to analyze
6	Interpretation and consideration of results	Analysis of the data obtained is interpreted and considered through group discussion.
7	Report and presentation of results	Write it in report and presenting

## III. Methodology

This research uses quantitative research with a descriptive approach. Quantitative research methods are research methods that are based on the philosophy of positivism, used to examine a population or specific sample, collecting data using research instruments, analyzing quantitative/statistical data to test established hypotheses. Descriptive research is research conducted to determine the value of independent variables, either one or more variables (independent) without making comparisons or connecting with other variables [18]. So quantitative research with descriptive approach is research obtained from the results of population and sample analysis with the statistical method that you want to use. With the steps of formulating questions in the form of questions, studying literature, formulating hypotheses, conducting research methodologies, observing, analyzing and making reports.

According to [18], the population as a generalization area consisting of objects/subjects that have qualitative and certain characteristics determined by researchers to be studied and then drawn conclusions. The population in this study were all students of class XI IPA of Bireuen Public High School 3. Samples are part of that population [18]. The sample in this study were students of class XI IPA<sub>2</sub> consisting of 30 students.

The research instrument used was a physics concept understanding test instrument in the form of a multiple-choice test consisting of 10 multiple-choice questions. The reason for using multiple choice tests is because they are objective tests, and facilitate assessment. Material momentum and impulses to be tested that include the concept of momentum, impulse, conservation of momentum, and system momentum.

The percentage category of students' understanding level can be seen in Table 2.

**Table 2.** Percentage of Shiva's Understanding Level [19]

No	Percentage	Category
1	$\leq 30\%$	Low
2	$30 \leq x \leq 60\%$	Medium
3	61-100%	High

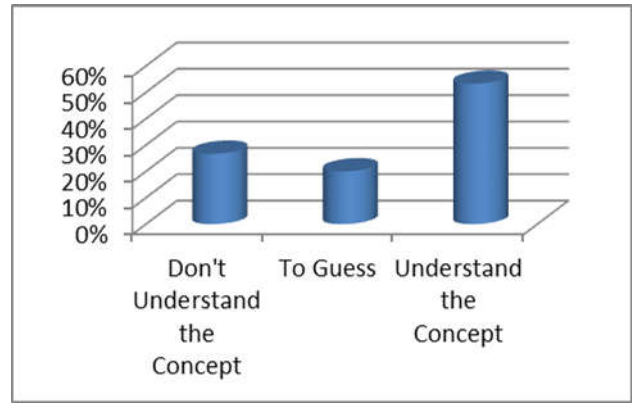
Criteria for understanding students' concepts can be seen in Table 3.

**Table 3.** Student Answer Criteria [19]

No	Question	Answer	Category
1	Multiple Choice	Right	Understand the concept
2	Multiple Choice	Right	To guess
3	Multiple Choice	Right	Don't understand the concept

**IV. Results and Discussion**

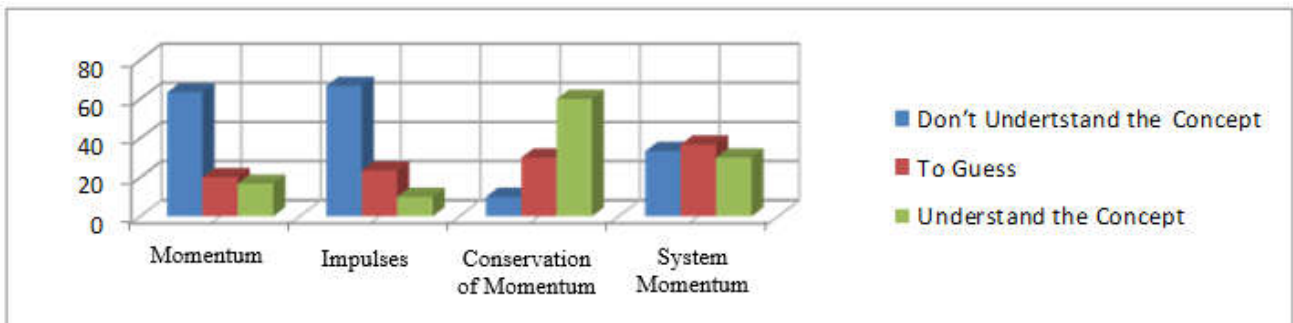
The results of data analysis that have been carried out at SMAN 3 Bireuen, on the material of momentum and impulse using research-based learning (RBL) learning models can be seen in Figure 1.



**Figure 1.** Percentage of students' understanding of concepts

Based on the results of data analysis shows that the understanding of students' concepts in the material of momentum and impulses using research-based learning (RBL) is in the medium category. From 30 students, the percentage of students understanding the concept category was 53.3%, the percentage of students guessing the category was 20% and the percentage of students in the category, not understanding was 26.7%.

Understanding the concept of sub-matter in the matter of momentum and impulse can be seen in Figure 2.



**Figure 2.** Percentage of students' understanding of the concept of Peru material

Based on the results of data analysis on students' understanding of the concept of sub-material, it can be seen that the submission of conservation of momentum is the most widely understood concept by students, with a percentage of 60%, while for understanding the concept the least amount is contained in impulse material with a percentage of 10% With a total of 10 multiple choice questions.

The most guessed category is found in the momentum submitter with a percentage of 30% while the least guessed category is found in the momentum submitter with a percentage of 16.7%.

The category of not understanding the concept is mostly found in impulse submersion with a percentage of 66.7% while the category of not understanding the concept is the least in the submission of conservation of momentum with a percentage of 10%.

**Reference**

**V. Conclusion**

The conclusion of this study is based on the analysis of research data, namely the understanding of students' concepts becomes more visible when researchers use the RBL learning model. This can be seen from the percentage of the results of data analysis which shows that of the 30 students in class XI<sub>2</sub>, the percentage of students understanding the concept category was 53.3%, the percentage of students guessing the category was 20% and the percentage of students in the category, not understanding was 26.7%. This shows students will better understand the concept of momentum and impulse by using research-based learning (RBL) learning models.

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