A preliminary study: how is extent the fourth-grade students understanding of the magnetic force?

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Abstract. This study purposes to identify about elementary level understanding of the magnetic force over experiential learning. The indicator of understanding aspect used purposes to extent students' understanding of the elementary school. The indicator that used in this study is a Bloom indicator. A descriptive-qualitative design and random sampling have previously been pretentious to accumulate data from fourth grade elementary students in one of Bandung Regency (27 participants: 9-10 years old). The instrument which is operated designed multiple choices with interview process. The significance shows that every aspect of understanding such as: modelling, classifying, comparing, explaining, and estimating students have dissimilar results. The students' understanding mostly lies in the indicators of the aspects of understanding the exemplifying part. Toward entirety up, students' understanding of elementary school is stumpy and necessities to be enhanced.

1. Introduction

It is precarious to the extended period strength of a country to intensification students interested in understanding of science. It is most precarious to construct an enthusiasm for science in the youngest students. The specified undertaking is to show students and the community “Science is Enjoyable, Science is Fascinating, and Science is Explicable” e.g. [1-3]. The indispensable in learning science is interest near a science action or program, which might deliver students a rich process to understand science material step by step e.g. [4-6].

Natural Science Learning held with stages will make students more understanding of the material of Natural Science they learn. This statement interprets into the prerequisite for students to acquire scientific substance material and purchase understanding of scientific concepts in the previously phases of their school e.g. [7-9]. One aim of science-educational involvements in elementary education is core to cognitive improvements of students in scientific understanding e.g. [7, 10-11]. An understanding of science is desirable to be an energetic member of knowledge civilizations e.g. [12-14], and each civilization desires people who are capable to create knowledgeable results approximately science-related issues.
One of the science-related issues is approximately magnetism. Magnetism is a corporate component of chief science programs and a cradle of interest to youngsters. Remarkably, elementary students’ intangible understanding of the phenomena of magnetism is an under-researched field e.g. [15-17]. Understanding abstract scientific phenomena like magnetism frequently involves some degree of mental imaging or envisioning. The statement is supported by the results of research showing that fourth-grade students of primary school find it difficult to understand the matter of magnetism. Many students have difficulties in indicating aspects of comparing comprehension. One of the mistakes made by students on comparing is because students rarely meet with questions that require them to define the relationship between two ideas or two objects. It can be seen in Figure 1 below.

![Figure 1. The difference of magnetic bar size.](image)

Many students do not know the correct answer to Figure 1, because many of them think that the magnetic force possessed by the magnet is affected by the magnetic size. In adding, teachers or soon-to-be teachers do not have an adequate understanding of Figure 1. In authoritative for Figure 1 to be straightforwardly understood, formerly there are several understandings that teachers really prerequisite: 1) The chattels of metals convened into ferromagnetic, diamagnetic, and paramagnetic; 2) There are three varieties of magnetic constituents, explicitly: a) permanent magnet mixture, b) ceramic permanent magnet, c) soft iron magnet, and d) protective magnet; 3) Magnetic field. Meanwhile magnetic field is a vector, earlier there is a formula for calculating magnetic field scale. In the magnetic field formula, magnetic field scale is transliterated through symbol B, as follows:

\[ B = \frac{\mu_0 I}{2\pi r} \]  

(1)

\( B \) is a magnetic field, \( \mu_0 \) is the permeability, \( I \) is a strong current, \( r \) is the distance to the wire.

Teachers also requirement to distinguish about the magnitude of the magnetic field in the center of solenoid and toroid, it can be seen in the following 2 and 3 formulas:

\[ B_p = \frac{\mu_0 I N}{l} \]  

(2)

\[ B = \frac{\mu_0 I N}{2\pi R} \]  

(3)

\( B_p \) is a magnetic field at the center of solenoid, \( \mu_0 \) is the permeability, \( I \) is a strong current, \( N \) is the number of turns.

Grounded on that circumstantial, the author’s definite to deliberate students understanding of magnetic force. Declining from the original discoveries, the highlighting of this study aims to invention out how the fourth-grade students elementary understanding of magnetic force. The consequence of this study is doubtless to be a deliberation for the correlated study that aims to enlarge students understanding in magnetic force.

2. Methods

Qualitative-descriptive method and random sampling was used in this study. It purposes to observe students without substantial action to the topics then the results are prevailing in a forthright and truthful way. The subject of research is a fourth-grade elementary student of one Bandung Regency (27 participants: 9-10 years old). They already knowledgeable about magnetism force in their school.
previously. Instruments used are multiple choice and interview. The multiple-choice question consists of 21 questions each representing the five indicators of the understanding aspect residing of exemplifying, classifying, comparing, explaining, and estimating. The data was composed through 21 questions and examined with classifying into five indicators. After the classification, then ensure a percentage to determine the extent of the ability of students in each indicator.

3. Results and Discussion

There are five indicators of the understanding aspect used to measure fourth-grade students' understanding of magnetic force. Figure 2 shows the recapitulation of test results from the understanding of magnetic force teaching materials for each indicator of understanding, as follows.

![Figure 2. Recapitulation of average percentage of understanding of the magnetic force of fourth-grade students in elementary school.](image)

Figure 2 shows about the understanding of magnetic force reach 39%. Figure 2 dominated by exemplifying indicator with the percentage of 68%. The indicators Classifying, Comparing, Explaining, and Estimating only get the percentage of 19%, 35%, 37%, and 39%. Many students say that they cannot answer the questions because they have never had the experience with that, so it is harder to deliver to students e.g. [18-20]. The low percentage and data interviews show that most of the student does not understand the magnetic force.

3.1. Exemplifying

Questions with this indicator illustrate the students understanding of magnetic force. This indicator has four questions that can illustrate how students understand in finding examples or illustrations of concepts or principles. The test results indicate that 93% of fourth-grade elementary students already have found examples or illustrations about concepts or principles. The results can be seen in Figure 3 below.
Figure 3. The test results based on the indicators find examples or illustrations about the concept or principle.

On the indicator of this understanding aspect, many students understand how to find examples or illustrations about concepts or principles. In Questions 3, there are only 48% of students who can understand this indicator. The percentage of questions 3 is the lowest percentage for the find examples or illustrations about the concept or principle indicator. It can be said that the result of find examples or illustrations about the concept or principle are high enough. Hence, the teaching process requirement construct on students’ prior knowledge e.g. [21-23].

3.2. Classifying

Questions in this indicator show the understanding of magnetic force. This indicator also has four questions that illustrate how students understand in determining something in a category. The test results indicate that 31% of fourth-grade elementary students already have determined something in a category. The results can be seen in Figure 4 below.

![Figure 4. Test result based on the indicator of determining something in a category.](image)

On the indicator of this aspect of understanding, many students do not understand how to determine something in a category. Student understanding of these indicators can be categorized as low. The lowest percentage on this indicator is Question 5 and 6 with the percentage of 14%. Student activities according to the indicator of determining something in a category can be seen in Figure 5.

![Figure 5. Student activities according to the indicator of determining something in a category.](image)

Hence, it is imperative to examine the hitches students have associated to significant concepts before the improvement of the teaching process e.g. [21, 24-25].
3.3. Comparing
This indicator has four questions that can illustrate how students understand in determining the relationship between two ideas or two objects. The test results indicate that 48% of fourth-grade elementary students already have determining the relationship between two ideas, two objects and the like. The results can be seen in Figure 6 below.

![Figure 6](image_url)

**Figure 6.** Test result based on the indicator of determining the relationship between two ideas, two objects and the like.

On the indicator of this aspect of understanding, many students do not understand how to determine the relationship between two ideas, two objects and the like. Based on that figure, many students answered wrongly. It can be said that determining the relationship between two ideas, two objects and such is comparatively low. Hence, the teaching process must construct an active learning situation e.g. [21, 26-27].

3.4. Explaining
This indicator has four questions that can illustrate how students understand in making causal models in a system. The test results indicate that 34% of fourth-grade elementary students already have created causal models in a system. The results can be seen in Figure 7 below.

![Figure 7](image_url)

**Figure 7.** Test results based on the indicator of creating causal models in a system.

At this aspect of the indicator of understanding, Question 14 is the question with the lowest percentage. Student activities according to the indicator of creating causal models in a system can be seen in Figure 8.
Many students do not understand how to create a causal model in a system. Based on that figure, many students answered wrongly. It can be said that creating a causal model in a system is low. Hence, students acquire an opportunity to construct a worthy knowledge structure e.g. [21, 28-29].

3.5. Estimating
This indicator has four questions that can illustrate how the students' understanding in capturing the intentions, not according to just what they are, but also by expressing their own opinions. The test results indicate that 38% of fourth-grade elementary students already have created causal models in a system. The results can be seen in Figure 9 below.

Based on that figure, Question 19 has the lowest percentage in case with other questions. Therefore, it can be said that catching capturing intent, not according to what it is, but also by expressing own opinions is low. Hence, the teaching process must help and response to students and also make the opportunity to arrange, rebuild and lengthen their knowledge e.g. [21, 30-31]. Thus, it can construct meaningful and active learning for students e.g. [31-34].
4. Conclusion
Almost all the indicators of the understanding aspect of the magnetic force fall into the low category except exemplifying (the indicators find examples or illustrations about the concept or principle). Through the consequences of this study, is predictable to be a representation for researchers who want to revenue this theme in the forthcoming.

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