



Analysis of Conceptual Errors of Force Material in Elementary School Student

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Abstract. One of the subjects taught at the elementary level is science, the concepts contained in the science material are very many that allow for misconceptions experienced by students. Understanding concepts is the main key in science learning, but there are still conceptual errors experienced by students, especially in force material., the purpose of this study are: 1) Analyzing the conceptual error of force material; 2) Describe the conceptual error of force material. The type of research in this article is qualitative ethnography. Data collection techniques for interviews, observations, and documentation. Validity of data by triangulation techniques. Inductive data analysis techniques. The data analysis process is data collection, data reduction, data display, verification and conclusion drawing. The results of the study were three: 1. The documentation results showed that out of 19 students, 11 students still experienced misconceptions, 2.) The interview results showed students' fallacies regarding the description of gravitational force 3.) Factors causing misconceptions in students.

Keywords: Science · Conceptual Error · Elementary School

1 Introduction

One of the subjects taught at the elementary level is science, the concepts contained in the science material are very many that allow for misconceptions experienced by students. Understanding concepts is the main key in science learning, because according to Syuhendri (2010: 134) in [1] concepts are an abstraction of the characteristics of something that makes it easier for humans to communicate and think. This concept that sticks in the student's mind will be a theory that will remain used as long as it is believed to be a concept that is considered correct.

However, there are still conceptual errors experienced by students, especially in the force material. The most common type of conceptual error is not the wrong understanding during the learning process but rather an initial conception (preconception) that students bring during the learning process [2]. Conceptual error in the field of science have occurred at different levels of education ranging from low levels of education to higher education [3]. Conceptual error are still something scary and always loom in every learning process, especially in learning the basic concepts of science [4].

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According to Andrews, et al. (2012) in [5] define a Conceptual error as an idea or scientifically inaccurate thought about a scientific concept. Usually Conceptual error concern students' mistakes in understanding the relationships between concepts [6].

People who experience conceptual error can be seen from certain traits. According to (Ibrahim, 2018), quoted from [7] a person who experiences a conceptual error is characterized by (1) the difference between the understanding of the person's concept and the understanding of the concept agreed upon by scientists; (2) the person is strongly convinced that the notion of his own concept is correct; (3) because they already feel confident in the definition of the concept, the person will survive with the concept he has and it will be difficult to change the concept of the person. Forms of conceptual error can be conceptual error, incorrect relationships between concepts and intuitive ideas or naïve views (Suparno, 2005) quoted from [8].

Previous research conducted by [9] regarding the conceptual error of science in force material carried out at the elementary school level stated that, the conceptual errors that occurred in grade 5 students of SD N 147 Pekanbaru were quite high, of the 7 sub-indicators studied, 4 sub-indicators were categorized as high, 2 sub-indicators were categorized as medium and 1 sub-indicator was categorized as low.

Furthermore, based on research conducted by [10], it was concluded that the factors causing the conceptual error of science are the wrong perception of the material being studied and the low interest in science subjects.

In addition, in the research conducted by [11], it was stated that the use of PDEODE strategies (Predict, Discuss, Explain, Observe, Discuss, Explain) had a good impact. Students feel more involved in the learning process and are considered not saturated so that the learning provided is able to increase understanding of concepts and reconstruct conceptions so that they are in accordance with real scientific concepts. Research conducted by [12] states that project-based learning models can improve students' understanding of concepts and can correct students' conceptual error.

Based on the description above, the purpose of this study are analyzing the conceptual error of force material and describing the conceptual error of force material in elementary school students.

2 Method

The type of research in this article is qualitative ethnography. Ethnographic qualitative research is a study that describes a culture of a group of people, culture in this case is a pattern of behavior of a certain group of people (Sutama et al., 2022). Place and time of research conducted at SD N 03 Jumantoro for one semester. The research subjects in this article are grade 5 students of SD N 03 Jumantoro totaling 19 students, 6 female students and 13 male students.

Data collection techniques by means of interviews, observations, and documentation. Interview according to Esterberg (2002) in [14] interview is a meeting of two people to exchange information and ideas through question and answer, so that meaning can be constructed in a particular topic, in this study, the researcher interviewed several students about style.

Observation can simply be defined as looking at the research situation, this technique is very suitable for use in classroom research which includes observing learning interactions, children's behavior, and children's interactions in their groups (Sutama et al., 2022). The observation made by the researcher is a participatory observation, where the researcher is really involved in the daily life of the respondent, in this right of the student. Documentation is defined as a record of events in the form of monumental writings, drawings, or works of a person who has passed [14]. The documentation used by researchers in this study is the results of students' daily tests

Validity of data with triangulation techniques. In data collection, triangulation techniques are used to test the credibility of data by checking data to the same source but with different techniques (Sutama et al., 2022). Data analysis techniques with inductive methods, namely research does not start from theoretical deductions but starts from empirical facts, researchers go into the field, study, analyze, interpret, and draw conclusions from phenomena in the field (Sutama et al., 2022)

3 Result

Based on the results of the study, it was found that 11 out of 19 students still experienced conceptual error of force material, this was evidenced by the results of students' daily test scores where there were 8 students who had scores above the standard of minimum completeness of mastery learning, and 11 who had scores below 80 which means that student scores are still below the standard of minimum completeness of mastery learning (Figs. 1 and 2).

3.1 Through Interviews with 5 Students, it is Known that the Cause of the Misconception of Stylistic Material in Students Comes from the Students Themselves, as in the Following Interview Snippets

Researcher: "Do you know about the force of gravity?"

Student: "I Don't know"

Researcher: "Have you heard/learned about gravitational forces?"

Student: "I've been, but forgotten"



Fig. 1. Students are doing daily tests

No	Nama	Nilai	No	NAMA	NILAI
1	MELIA ALYSSIA W.	70	1		
2	ANISA ZULFIYAH	70	2		
3	RAHMADIA SORAH	75	3		
4	ADRIANUS ANTONIUS	75	4		
5	INDRA PERMANA	75	5		
6	DRACHA MULIA NIKIT	75	6		
7		75	7		
8	FRANKA RIZKA FANANI	75	8		
9	ANGGUS RIZKA SYAH	75	9		
10	WALYATI A. PRIMA	75	10		
11	RIZKA LESLIE F.	75	11		
12	KARINATI WIDHIANA	75	12		
13	RUBIADAN VIB VIB	75	13		
14	RIKA RANDE	75	14		
15	FAU DANUS PRANUS	75	15		
16	CIPTA BELI DINDANG	75	16		
17	SYAHIRAH ANIS SAHARA	75	17		
18	TIARA INDAH PRATIKA	75	18		
19	WILSONA ESKA F.	75	19		
20	MIZAM MULLA AL.	75	20		
21		80			
22					
23					
24					
25					
26					
27					
28					
29					
30					

Fig. 2. Daily replay score list

Researcher: "Why did you forget?"

Student: "Because it has been a long time and not repeated"

Based on the excerpt of the interview, the cause of the conceptual error of force material in students is the limited memory of students. This is supported by research from (Karomah et al., 2018), the causes of conceptual error in students include the students themselves, teachers, textbooks, and learning methods used in learning. Students who experience conceptual error can also be caused by students' difficulty in understanding concepts. In the study conducted by [15] it was also stated that one of the factors for the occurrence of conceptual error was cognitive limitations and low reading interest, which was in line with the results of interviews with students of SD N 03 Jumantoro

3.2 Furthermore, the Factors Causing the Occurrence of Conceptual Error are also Supported by the Environment. As the Interview Excerpts Below

Researcher: "when you throw a stone up, what happens next?"

Student: "the stone fell to the ground"

Researcher: "Why did it fall?"

Student: "Because the stone is heavy"

Based on the results of the interview above, it can be known that the cause of the conceptual error of force material in elementary school students comes from the direct experience of students, namely when students throw stones. This is supported by research that has been carried out, [11] which states that the biggest cause of the misconception of science is intuition. Intuitive thinking usually comes from constant observation of objects or events. Research conducted by [16] also states that the biggest cause of conceptual error in science is students' wrong reasoning or their reasoning for erroneous concepts. This is corroborated by research from [17] which states that conceptual error are caused by students' associative thinking. Because, student association thinking can shape a student's ability to respond to what he has seen.

3.3 The Causative Factor of Conceptual Error of Force Material in Students can also Originate When the Learning Process Takes Place. As the Interview Excerpts Below

Researcher: "When learning the force of gravity, does the teacher carry the media?"

Student: "None"

Researcher: "In addition to the force of gravity, in other materials the force does it use any learning media?"

Student: "there is, in the magnetic force using magnets"

Researcher: "Is there material in the textbook that you don't understand/confuse you about the force?"

Student: "None"

Based on the results of the interview above, the cause of the conceptual error of force material in students is caused by the teacher's teaching method which is still conventional in the form of lectures and material textbooks. This is supported by research from [18], it is stated that one of the factors causing the misconception of science is the teacher-centered learning process, and the absence of fixed learning resources so that teachers become the only source of student information. In research conducted by [19], it was also stated that improper teaching methods or teachers' attitudes in relating to students are one of the factors causing the conceptual error of science. This is also supported by a statement from Sutrisno's research (2008: 8) quoted from [20], namely teachers who do not have competence in the field of science and do not come from graduates who are in accordance with their fields is also one of the causes of prolonged misconceptions.

4 Conclusion

The documentation results show that out of 19 students, 11 students still have misconceptions while the other 8 students already know the concept. The interview results showed students' mistakes regarding the description of gravitational force. The factors causing misconceptions in students are the students themselves, teachers, textbooks, and learning methods used in learning the use of textbooks that are not optimal.

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