JPPIPA 9(10) (2023)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Study of Students' Concept Understanding and Argumentation Levels of Material Magnets at Class VI-IX Level

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Received: July 26, 2023
Revised: September 4, 2023
Accepted: October 25, 2023
Published: October 31, 2023

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DOI: 10.29303/jppipa.v9i10.4800

Abstract: This study airms to examine differences in understunding the concept of magnets and arguments about magnets at different grade levels. This type of research is survey research. The research subjects consisted of 188 students spread across different grade levels and school in the city of Kupang, namely class VI of elementary school, class VII of junior high school and class IX of junior high school. The method used is the ex post facto method using test instrumens and interview. The data analysis used is the difference test and correlation test. The conclusion obtained after carrying out the research proces and data testing is that there are differences in understanding of the concept of magnets between class VI students who are currently learning about magnets in class VI, class IX students who are currently studying magnets and have studeied magnets in class VI. There are differences in the level of magneic argumentation between class VI students who are currently learning about magnets, class VII students who have studied magnets in class VI and grade IX students who are currently studying magnets and have stidied magnets in grade VI. There is no correlation between understunding of the concept and level of argumentation of magnetic material in class VI elementary school students and class VII students of junior high school.

Keywords: Arguments; Magnets; Understunding concepts.

Introduction

The understanding of science includes facts or phenomena, sub-microscopic or concepts and symbols (Paton et al., 2000). Understanding phenomena in a school environment, namely students must be able to explain a fact conceptually and symbolically. This is very important so that after living in the community students can understand information based on concepts/data (not hoaxes). Understanding the concept is not only a problem that students can be free from a fact, but with a known concept, students are able to explain to others about the phenomena they know and are able to compete fairly in the world of education. In other words, if a concept is instilled in students, a good understanding of the concept will provide good insight into knowledge to be applied in everyday life (Suprianto et al., 2020).

The era of the industrial revolution was an era where changes in science were quite large. With this rapid development, students are required to be able to argue, namely to be able to explain rationally/logically based on data/facts and the relationship between facts and concepts to a phenomenon (Sitompul, 2022). The need for argumentation in the era of the industrial revolution is very important because it is a form of scientific communication. Therefore students need to learn to develop their argumentation skills from elementary school as early education (Daulay et al., 2021).

How to Cite:
Betty, Y. I., Dasna, I. W., & Widiyanti, W. (2023). Study of Students' Concept Understanding and Argumentation Levels of Material Magnets at Class VI-IX Level. *Jurnal Penelitian Pendidikan IPA*, *9*(10), 8890–8902. https://doi.org/10.29303/jppipa.v9i10.4800

Understanding the concept provides a really strong basis for an argument (Hasnunidah et al., 2019). Argumentation as a process of strengthening claims through critical analytical thinking based on evidence and logical reasoning. A strong argument uses many relevant and specific justifications to support claims with sound conceptual evidence (Kathpalia & See, 2016). Conversely, a weak argument is shown by unscientific, inaccurate, and non-specific considerations (Kathpalia & See, 2016). Argumentation as a form of scientific communication has levels, namely: providing ideas (Claim); providing data/evidence in the form of formulas and/or theories or experimental data (Grounds); providing justification (Warrant); providing support (backing); qualifications (qualifier) and providing a possible rebuttal. With this fundamental level, students will better understand their abilities (Martini et al., 2021).

In addition to the levels of arguments such as claims, data, warrants, backing and possible rebuttal that are understood by students to give encouragement to be able to channel opinions appropriately, another important factor is students' understanding of concepts. Understanding of this concept can be monitored from students' abilities when solving a problem which can be seen from the difference in their level of thinking before and when they have carried out the learning process (Martini et al., 2021). Most students feel that the concept is difficult. The creation of an atmosphere in class that is boring, watching and stiff because students receive more material transfers from the teacher and memorize material more than doing the process of finding it themselves. So to understand a concept, a very strong mental and reasoning process is needed (Johnson-Laird, 2010).

The results of previous research show that mastery of concepts and argumentation skills are closely related to one another (Noviyani et al., 2017). The level of students' ability to argue is influenced by the students' ability to master the concepts being taught. These concepts must be instilled when students are still in elementary school so that they can still be understood even though they have moved up the grade level or are getting older (Noviyani et al., 2016). Understanding of concepts is influenced by the quality of learning in schools and student learning experiences. Deep learning (deep learning) will be able to provide a good understanding to students so that they can also provide good arguments (Fullan & Langworthy, 2014). In another case, we examined the structure of arguments and critical thinking questions and the results of this study showed that students in the experimental group were not only successful in compiling critical thinking questions but were also able to construct arguments containing arguments and counterarguments simultaneously. Previous research also explained that students' scientific argumentation abilities in elementary schools were still very low, where most students were only able to be at the lowest level 1. Most students were not able to present arguments that could be categorized as scientific arguments (Jumadi et al., 2021). In this case, to equip every student in the digital era, in this case critical thinking, creative thinking, effective communication and high efficiency, basic provisions are needed because what is needed in an educational environment is by utilizing teaching approaches that are considered useful in acquiring these skills (Santika, 2021). One of these approaches is argumentation-based teaching stating that argumentation-based teaching can be chosen as an alternative to the experimental method but there must be a strengthening of the basic concepts (Kalemkus et al., 2021). For teachers to take advantage of argumentation-based teaching, each student must be familiar with argumentation-based teaching activities so that they are then able to create argumentation activities in places around them such as schools, homes and communities. Teachers also need to gain awareness about teaching in the learning process in this case the teacher plays an active role in instilling basic concepts. In this way, teachers can motivate their students to think about their own learning, leading to improved learning outcomes.

The argumentation abilities of elementary and junior high school students are still lacking, namely at the same level (Amalia et al., 2018). So it is necessary to study students' understanding of magnetic material during study and after learning a material and the quality of the arguments. This study is very important to be used as a reference by teachers in teaching science to elementary and junior high school students. In order to be able to design learning that can increase conceptual understanding and strengthen arguments, data on student conditions such as understanding of concepts possessed after learning or at different levels is needed. Data on this subject is not widely available. There are already research results on understanding concepts and arguments in Indonesia that examine understanding concepts and arguments but students are not used to doing scientific arguments (Siswanto et al., 2014). So that further research is needed with higher studies to get bigger results. Study of conceptual understanding and level of argumentation at different grade levels in basic education is important information for developing learning problem solving.

A survey of the level of conceptual understanding and argumentation in this research uses magnetic material because it is already known by students in everyday life. This material was chosen because magnets

are one of the materials studied in elementary school where the material about magnets is a natural event that students can appear and encounter every day. Thus students can study carefully because they have seen it in the natural surroundings, but in reality students feel that the material about magnets being studied at school is something new. This is what causes the ability to understand students' concepts is still low.

Method

The researcher conducted a survey of students' understanding and arguments without carrying out learning treatments (Ex Post Facto method) because the independent variables in this study were not controlled or treated specifically but only revealed facts based on measuring symptoms that had existed in the respondents before this research was carried out. This research will be conducted on fourth grade students who are currently studying magnets, seventh grade students who have studied magnets 12 months ago in class VI and class IX students who have studied magnets 24 months ago in class VI then are currently reinforcing the magnetic material in class IX.

The subjects in this study were 1 class of students in class VI, 1 class in class VII and 1 class IX from private schools and public schools totaling 188 students, consisting of 67 students in class IV SD, 61 students in class VII SMP and 60 students in class IX Middle School. Elementary students include SDN B class VI (35 students), SDK D VI (32 students), junior high school students include class VII SMPN (31 students), SMPN class IX (30 students), SMPK G class VII (30 students) and SMPK G class IX (30 students). The survey results in the form of understanding and argumentation scores were analyzed descriptively and deepened by interview data.

Result and Discussion

Concept Understanding Analysis

The data obtained by the researcher was based on the results of the tests that had been carried out by the students and then several students were interviewed to strengthen students' answers to the questions they had worked on. The students' conceptual understanding data was obtained from the total score of students' answers on the instrument test of 15 questions. The distribution of conceptual understanding data for students in grade VI SD, students in grade VII in junior high school and students in grade IX in junior high school can be seen in table 1.

Based on the data in Table 1, of the 5 concepts surveyed, students' understanding of the concept of magnets in grade VI elementary school had the highest level of understanding on the concept of analyzing the forces of attraction and repulsion on magnets and the lowest on the concept of designing how to make magnets. In class VII junior high school students, the highest concept was the concept of analyzing the attractive and repulsive forces on magnets and the lowest was the concept of designing how to make magnets. In class IX junior high school students, the highest concept is the concept of analyzing the attractive and repulsive forces on magnets and the lowest is the concept of designing how to make magnets.

Concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets, the most difficult concept for grade VI elementary school students to understand is the sub-concept about the parts of a horseshoe magnet. This happens because sixth grade elementary school students do not understand the sub-concept. Based on the results of interviews with students, it is known that they do not study more deeply on these sub-concepts. Concept 2 which consists of 3 questions about determining magnetic poles, the most difficult concept for elementary school students to understand is the sub-concept about determining magnetic properties. This happens because students do not understand and understand the sub-concept. Based on the results of interviews with students, it is known that students are not able to integrate knowledge in everyday life. Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on a magnet, the most difficult concept for elementary school students to understand is analyzing the attractive and repulsive forces on a bar magnet. This happens because students forget the concept. Based on the results of interviews with students, they do not do repetitive exercises. Concept 4 which consists of 3 questions about analyzing magnetic fields, the most difficult concept for elementary school students to understand is the concept of the area around a magnetic field. This happens because students do not understand the concept of magnet material. Based on the results of interviews with students, it is known that students are not interested in learning magnets. Concept 5 which consists of 3 questions about designing how to make magnets, the most difficult concept for elementary students to understand is designing how to make magnets electromagnetically. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not like studying magnets.

Table 1. Distribution of Concept Understanding of Grade VI Elementary School Students, Grade VII Middle School Students and Grade IX Middle School Students Against 15 Magnet Concepts

Concept	Number of questions	SD Respondent Answers		Number of Respondents in class VII SMP		Number of Respondents class IX SMP	
		correct	wrong	correct	wrong	correct	wrong
Explain the types, parts and functions of magnets	1	58	9	50	11	56	4
	2	26	41	34	27	25	35
	3	50	17	34	27	42	18
Determine the magnetic poles	4	38	29	19	42	37	23
	5	32	35	35	26	50	10
	6	52	15	45	16	57	3
Analyze the attractive and repulsive forces on magnets	7	59	8	52	9	59	1
	8	40	27	44	17	59	1
	9	57	10	51	10	46	14
Analyze the magnetic field	10	38	29	21	40	40	20
	11	41	26	43	18	55	5
	12	53	14	35	26	53	7
Design a method of making magnets	13	36	31	23	36	32	28
	14	13	53	10	51	12	48
	15	52	13	44	17	51	9

Class VII students of junior high school study magnets with concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets. The most difficult concept for class VII junior high school students to understand is the sub-concept about the parts of a horseshoe magnet and a needle magnet. This happened because the seventh grade students of junior high school did not understand the concept. Based on the results of interviews with students, it is known that students have never studied magnets. Concept 2 which consists of 3 questions about determining the magnetic poles, the most difficult concept for class VII junior high school students to understand is the sub-concept about determining the poles of a bar magnet. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not do enough practice questions. Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on a magnet, the most difficult concept for elementary school students to understand is the sub-concept of analyzing the attractive and repulsive forces on a bar magnet. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that there is a lack of time allocation in learning activities in this concept. Concept 4 which consists of 3 questions about analyzing magnetic fields, the most difficult concept for elementary school students to understand is the magnetic strength sub-concept. This happens because students do not understand the concept based on the results of interviews with students it is known that students do not learn directly (practice) but only theory. Concept 5 which consists of 3 questions about designing how to make magnets, the most difficult concept for elementary school students to understand is designing how to make magnets by rubbing. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not study at school, but only study online. In general, seventh grade junior high school students forgot about the concept of magnets because based on interviews on magnet material studied by seventh grade junior high school students, 12 months ago, seventh grade junior high school students had never done a practicum on magnets.

Grade IX junior high school students study magnets with concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets. The most difficult concept for students in grade IX junior high school is the sub concept of the parts of a horseshoe magnet. This happened because the seventh grade students of junior high school did not understand the concept. Based on the results of interviews with students, it is known that students do not learn to explore these sub-concepts. Concept 2 which consists of 3 questions about determining the magnetic poles, the most difficult concept for class VII junior high school students to understand is the concept of determining the poles of a bar magnet. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not learn repeatedly on these sub-concepts. Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on magnets, the most difficult concept for elementary school students to understand is analyzing the attractive and repulsive forces on magnets and objects. This happens because

students do not understand the concept. Based on the results of interviews with students, it is known that students do not carry out practical activities. Concept 4 which consists of 3 questions about analyzing magnetic fields, the most difficult concept for elementary school students to understand is the concept of magnetic strength. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that there is a lack of availability of learning resources in schools. Concept 5 which consists of 3 questions about designing how to make magnets, the most difficult concept for elementary students to understand is designing how to make magnets electromagnetically. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students like learning these concepts.

Prerequisite Test Results

Normality test, the available research data has gone through an analysis process that aims to find out whether the data is normally distributed or not, as one of the conditions for being able to carry out a different test. The results of the normality test conducted on students of class VI SD and students of class VII SMP are data that are not normally distributed. The results of the normality test conducted on students of class VI SD and students of class IX are data that are not normally distributed.

Homogeneity test, the results of the homogeneity test conducted on students of class VI SD and students of class VII SMP are homogeneous data. The results of the homogeneity test conducted on students of class VI SD and students of class IX SMP were that the data were not homogeneous. The results of the normality and homogeneity tests showed that between grade VI elementary school students and seventh grade junior high school students the data were not normal and homogeneous, so a different test was performed using the Mann Whitney test, while the results of the normality and homogeneity tests showed that between grade VI elementary school students and grade IX junior high school students the data were not normal and not homogeneous then a different test was performed using the Mann Whitney test.

Difference Test

The results of the Mann Whitney test can be concluded that there are differences in understanding the concepts of sixth grade elementary school students and seventh grade junior high school students and it can be seen from the results of the analysis that 0.041 is greater than the significance value of 0.05. The results of the Mann Whitney test for students in class VI SD and students in class IX SMP obtained a value of 0.000, which means it is smaller than the significance value of 0.05 so that there are differences in understanding the concepts of students in class VI SD and students in class IX SMP.

Analysis of the Level of Argumentation

The level of student argumentation measured in class VI SDN and SDS students was 67 students

Concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets, students argue more at level 1 in the sub-concept explaining the function of a needle magnet. This happens because sixth grade elementary school students do not understand this sub-concept. Based on the results of interviews with students, it is known that students do not master these sub-concepts. Concept 2 which consists of 3 questions about determining magnetic poles, students argue more at level 1 in sub-concepts about determining magnetic properties. This happens because students do not understand the sub-concept. Based on the results of interviews with students, it is known that students are not used to giving reasons when learning these sub-concepts. Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on magnets, students argue more at level 1 on the sub-concept of analyzing the attractive and repulsive forces on bar magnets. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not do much practice on these sub-concepts. Concept 4 which consists of 3 questions about analyzing magnetic fields, students argue more at level 1 on sub-concepts of areas around magnetic fields. This happens because students do not understand the sub-concept. Based on the results of interviews with students, it is known that students are not interested in learning magnets. Concept 5 which consists of 3 questions about designing how to make magnets, students argue more at level 1 in the sub-concept of designing ways to make magnets electromagnetically. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students do not dislike learning these sub-concepts.

Table 2. Analysis of the Level of Argumentation All 67 students from Public and Private Elementary Schools

The concept of material or indicators that are measured	Number of questions	Percentage of Elementary School Respondents class VI			
		L-1	L-2	L-3	L-4
Explain the types, parts and functions of magnets	1	31	28	8	0
	2	1	48	18	0
	3	3	45	19	0
Determine the magnetic poles	4	4	19	44	0
	5	3	7	57	0
	6	18	10	39	0
Analyze the attractive and repulsive forces on magnets	7	6	10	51	0
	8	53	3	11	0
	9	12	16	39	0
Analyze the magnetic field	10	23	9	35	0
	11	16	1	50	0
	12	1	33	33	0
Design a method of making magnets	13	28	11	28	0
	14	35	20	12	0
	15	15	17	35	0
Total		249	277	479	0
Percentage (%)		25	28	48	0

Information:
L-1 = Level 1 (Claim)
L-2 = Level 2 (Data)
L-3 = Level 3 (Warrant)
L-4 = Level 4 (Backing)

Concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets, students argue more at level 1 in the sub-concept explaining the function of a needle magnet. This happens because class VII students of junior high school do not understand this sub-concept. Based on the results of interviews with students, it is known that students do not master these sub-concepts. Concept 2 which consists of 3 questions about determining magnetic poles, students argue more at level 1 in sub-concepts about determining magnetic properties. This happens because students do not understand the sub-concept. Based on the results of interviews with students, it is known that students are not used to giving reasons when learning these sub-concepts. Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on magnets, students argue more at level 1 on the sub-concept of analyzing the attractive and repulsive forces on bar magnets. This happens because students do not understand the concept.

The level of student argumentation as measured in class VII junior high school students was 61

Table 3. Analysis of the Level of Argumentation All 61 grade VII students of junior high school

The concept of material or indicators that are measured	Number of questions	Percentage of Elementary School Respondents class VI			
		L-1	L-2	L-3	L-4
Explain the types, parts and functions of magnets	1	34	23	4	0
	2	7	33	21	0
	3	12	33	16	0
Determine the magnetic poles	4	10	16	35	0
	5	4	17	40	0
	6	19	15	27	0
Analyze the attractive and repulsive forces on magnets	7	10	6	45	0
	8	28	18	15	0
	9	5	6	50	0
Analyze the magnetic field	10	30	15	16	0
	11	10	8	43	0
	12	7	40	14	0
Design a method of making magnets	13	28	6	27	0
	14	34	10	16	0
	15	8	19	34	0
Total		246	265	403	0
Percentage (%)		27	29	44	0

Information:
L-1 = Level 1 (Claim)
L-2 = Level 2 (Data)
L-3 = Level 3 (Warrant)

L-4 = Level 4 (Backing)

Based on the results of interviews with students, it is known that students are not given the opportunity to practice arguing on these sub-concepts. Concept 4 which consists of 3 questions about analyzing magnetic fields, students argue more at level 1 on sub-concepts of areas around magnetic fields. This happens because students do not understand the sub-concept. Based on the results of interviews with students, it is known that students do not practice to explore the concept. Concept 5 which consists of 3 questions about designing how to make magnets, students argue more at level 1 in the sub-concept of designing ways to make magnets electromagnetically. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that students have never learned how to design magnets.

The level of student argumentation measured in class IX junior high school students was 60 students

Table 4 Analysis of the Level of Argumentation of All Grade IX Junior High School Students as many as 60 students

The concept of material or indicators that are measured	Number of questions	Percentage of Respondents SMP class IX			
		L-1	L-2	L-3	L-4
Explain the types, parts and functions of magnets	1	39	1	19	1
	2	6	14	40	0
	3	4	6	50	0
Determine the magnetic poles	4	1	8	51	0
	5	1	1	55	3
	6	1	17	42	0
Analyze the attractive and repulsive forces on magnets	7	1	11	47	1
	8	54	1	5	0
	9	7	5	48	0
Analyze the magnetic field	10	46	2	10	2
	11	5	9	45	1
	12	10	46	4	0
Design a method of making magnets	13	39	11	10	0
	14	23	6	31	0
	15	10	7	43	0
Total		247	145	500	8
Percentage		28	16	56	1

Information:
L-1 = Level 1 (claim)
L-2 = Level 2 (Data)
L-3 = Level 3 (Warrant)
L-4 = Level 4 (Backing)

Concept 1 which consists of 3 questions about explaining the types, parts and functions of magnets, students argue more at level 1 in the sub-concept explaining the function of a needle magnet. This happens because sixth grade elementary school students do not understand this sub-concept. Based on the results of interviews with students, it was found that students did not do enough practice questions on the sub-concept. Concept 2 which consists of 3 questions about determining magnetic poles, students argue more at level 2 in sub-concepts about determining magnetic properties. This happens because students understand the sub-concept. Based on the results of interviews with students, it is known that students can give reasons when learning these sub-concepts.

Concept 3 which consists of 3 questions about analyzing the attractive and repulsive forces on magnets, students argue more at level 1 on the sub-concept of analyzing the attractive and repulsive forces on bar magnets. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that there is a lack of learning resources around students. Concept 4 which consists of 3 questions about analyzing magnetic fields, students argue more at level 1 on sub-concepts of areas around magnetic fields. This happens because students do not understand the sub-concept. Based on the results of interviews with students, it is known that students are not interested in learning magnets. Concept 5 which consists of 3 questions about designing how to make magnets, students argue more at level 1 in the sub-concept of designing how to make magnets by rubbing. This happens because students do not understand the concept. Based on the results of interviews with students, it is known that there is a lack of time allocation for doing practicum.

Correlation test analysis

Correlation of Concept Understanding and Level of Student Argumentation was tested using the Person product moment correlation test with the help of SPSS version 23.

Table 5. Correlation of Conceptual Understanding and Level of Argumentation in Grade VI Elementary School Students

		Concept Understanding	Argumentation Level
Concept Understanding	Pearson Correlation	1	0.223
	Sig. (2-tailed)		0.425
	N	15	15
Argumentation Level	Pearson Correlation	0.223	1
	Sig. (2-tailed)	0.425	
	N	15	15

Based on Table 5, the Pearson correlation (rxy) value was 0.223, so there was a low correlation between conceptual understanding and the level of argumentation of sixth grade elementary school students. Based on Table 6, the value of the correlation coefficient (rxy) is 0.391, so there is a low correlation between understanding of concepts and the level of argumentation of class VII students of junior high school. Based on Table 7, the value of the correlation coefficient (rxy) is 0.014, so there is a very low correlation between understanding of concepts and the level of argumentation of class IX students of junior high school.

Table 6. Correlation of Concept Understanding and Level of Argumentation in Class VII Middle School Students

			Concept Understanding	Argumentation Level
Spearman's rho	Concept Understanding	Correlation Coefficient	1.000	0.391
		Sig. (2-tailed)	.	0.150
		N	15	15
	Argumentation Level	Correlation Coefficient	0.391	1.000
		Sig. (2-tailed)	0.150	.
		N	15	15

Table 7. Correlation of Concept Understanding and Level of Argumentation in Class IX Middle School Students

			Concept Understanding	Argumentation Level
Spearman's rho	Concept Understanding	Correlation Coefficient	1.000	0.391
		Sig. (2-tailed)	.	0.150
		N	15	15
	Argumentation Level	Correlation Coefficient	0.391	1.000
		Sig. (2-tailed)	0.150	.
		N	15	15

Understanding of the Magnet Concept in Grade IX Middle School Students, Grade VII Middle School Students and Grade VI Elementary School Students

Natural Science is very important because it is one of the basic knowledge about the universe in concept and fact. Anyone who has known education from the basics should understand correctly the concept of a material so that it is able to explain it correctly to many people. A strong and correct concept that can be given since elementary education will have a big influence when giving arguments. The relationship between understanding a concept and an explanation is not as easy and simple as one might think. so far students have only been able to provide explanations while the purpose of the explanation is only limited to providing understanding while it is necessary to know that arguments aim to convince (Izquierdo-Acebes & Taber, 2023).

Based on the research results, it was obtained data on the number of students at private schools and public schools in Kupang City as many as 188 students divided into 32 students in class VI SDS, 30 students in class VII SMPS and 35 students in class IX SMPS and 31 students in class VI SDN, 30 students in class VII SMPN and 30 students in class IX SMPN.

The results showed that there were differences in students' understanding of concepts at different grade levels. The difference in understanding this concept is based on the distribution of 15 conceptual understanding questions. There are 22% of students in grade VI SD who are currently learning about magnets and answered correctly in the problem of understanding the concept. There were 19% of students in class VII of junior high school who had studied magnets in grade VI. They answered correctly in the problem of understanding concepts, and 23% of students in class IX of junior high school who were currently studying magnets and had already studied magnets in class VI answered correctly. Each level only understands certain concepts or indicators with different values.

Based on the results of the study it was found that in concept 1, namely the concept of explaining the types, parts and functions of a magnet, there were 23% of students in class VI of SD who answered correctly, there were 20% of students in class VII of SMP who answered correctly and there were 21% of students in class IX of SMP who answered correctly. Concept 2 is to determine the poles of a magnet. There are 21% of grade VI elementary school students who answer correctly, there are 17% of grade VII students of junior high school who answer correctly and there are 25% of grade IX students of junior high school who answer correctly. The results of the research found that in concept 3, namely analyzing the force of attraction and repulsion on a magnet, there were 27% of class VI students who answered correctly, there were 26% of students in class VII of junior high school who answered correctly and there were 29% of students in class IX of junior high school who answered correctly. The results of the study found that in concept 4, namely analyzing the magnetic field, there were 23% of grade VI elementary school students who answered correctly, there were 17% of grade VII junior high school students who answered correctly and there were 26% of grade IX students who answered correctly. The results of the study found that in concept 5, namely designing a way to make magnets,

17% of students in grade VI SD answered correctly, 13% of students in class VII answered correctly and 16% of students in class IX answered correctly. Overall, based on the results of the percentages, it was stated that the students in grade VI SD had high understanding of the concept, so the level of argumentation was also high. From the results of the interviews, it was known that students in grade VI SD studied magnets well, using several learning resources. The students' understanding of seventh grade junior high school concepts decreased (low) and the level of argumentation decreased (low), the results of the interviews revealed that students studied more on their own, did not study magnets directly with the teacher but online and did not do practicum. The students' understanding of the concept of class IX SMP returned high and the level of argumentation was high, the results of the interviews revealed that class IX students studied magnets directly at school, students liked learning magnets and students did practice.

Overall students understand more about indicator 1 explaining the types, parts and functions of magnets and the concept of analyzing the forces of attraction and repulsion on magnets and students do not understand concept 5, namely the concept of designing how to make magnets. This is caused by a lack of understanding of the concept in magnetic learning, students do not do a lot of practical processes directly. The results of the interviews also showed that students did not practice much about magnetic material concept indicators including designing how to make magnets. An educator has a big responsibility in developing students' understanding of concepts (Fitriani et al., 2021). Understanding of the concept of magnets given to students in class VI SD is not optimal so that when students are at a higher level, students' understanding of concepts begins to decline. In an effort to provide maximum conceptual understanding, students do not only focus on 1 indicator but are able to master all the magnet concepts. Weak understanding of concepts can influence students to focus on 1 concept (Viyanti et al., 2016).

The results of the interviews also showed that some of the seven grade students forgot about the concept of magnetic material. This proves that when students are in class VI, learning about magnets is not done optimally. Students lack experience, lack the opportunity to experience natural phenomena that they must learn and master. Students are not encouraged to be involved in the learning process so that students experience difficulties in understanding the subject matter and their learning outcomes are not optimal (Fitriani et al., 2021).

There are differences in understanding the concept of magnets in state students and private students. Based on the average understanding of the concept of private students have a higher understanding of the concept of magnets. The results of observations of private students were very disciplined both in school entry and in class attendance. Private students study natural science materials using several books, namely thematic books, worksheets and kartika books for sixth grade elementary school students, while integrated science books and books and worksheets are used by students in class VII of junior high school and class IX of junior high school.

The Level of Argument in Grade IX Middle School Students, Grade VII Middle School Students and Grade VI Elementary School Students

Students who have a good understanding of concepts will be able to argue scientifically. Not only limited to arguing because they remember, but students are able to argue up to a high level as evidenced by the justification they know. The ability to argue is influenced by several factors, for example the opportunity to argue and the ability to channel arguments, so that various activities that involve arguments need to be increased (Kartika Sari & Izzatin Nada, 2021). Elementary school students become a reference for teachers to provide the right concepts so that students are able to argue properly and correctly when they are at a higher level. Since being in elementary school, it is necessary to know the level of argumentation possessed by students so that this becomes a reference for teachers in providing conceptual understanding material to students

The reasoning abilities of elementary and junior high school students can be reviewed based on the level of each student's argument in each indicator of the magnet concept. The argumentation level includes level 1 (claim), level 2 (data), level 3 (warrant) and level 4 (backing). The reasoning abilities of students in grade VI SD and class VII SMP students have reached level 1, level 2 and level 3 while the ability to argue in class IX SMP students has reached level 1, level 2, level 3 and level 4. The ability to argue in class VI SD students, students in class VII SMP and students in class IX SMP was seen when being interviewed regarding magnetic material, students argued according to the facts they had experienced. (Table 4). The results showed that the argumentation level of 67 elementary school students at level 1 was 25%, level 2 was 28% and level 3 was 48%. The highest level of argumentation achieved by elementary school students was level 3 (warrant). The argumentation level of 61 students of class VII SMP at level 1 was 27%, level 2 was 29% and level 3 was 44%. The highest level of student argumentation is at the 3% level. The argumentation level of 60 grade IX junior high school students at level 1 was 28%, level 2 was 16%, level 3 was 56% and level 4 was 1%. The highest level of student argumentation is at the 3% level, but there is 1% of 60 grade IX junior high school students who are able

to argue using their knowledge and have good literacy about magnets. Although the level of argumentation of students in class VI, class VII and IX is still low, based on the findings some students are able to argue at level 1, level 2 and level 3 in class VI elementary school students and some class IX students are able to argue at level 4. In contrast to previous research that the quality of students' argumentation in basic education is still very low because students are only able to argue at level 1 (Rahman, 2018).

Previous researchers stated that students were able to provide arguments at level 1 (claim) if it was based on justification from the basic concepts that these students obtained (Ginanjar et al., 2015). Student arguments are not only limited to theory but must be justified so that they can reveal the facts contained in science learning. Students who often use evidence in arguing will still remember and understand the concept of a material (Sudarmo et al., 2018). If students understand the concepts in elementary school well and do it repeatedly, students are able to argue at a higher level at a higher level. The increase in the level of student argumentation is influenced by students' habit of repeating learning (Fatmawati et al., 2018). Grade VI students have just received magnet material so their conceptual understanding of this material has not been influenced by other activities. In line with Noviyani et al., (2017) that every student is able to give a good argument if he has just studied facts and investigations. Lack of optimal learning activities between teachers and students can result in a lack of argumentation activity between students and students and students and teachers. This is in line with previous researchers where the ability to argue is formed if students are used to doing arguments continuously (Kartika Sari & Izzatin Nada, 2021). The lack of student involvement in learning activities will affect the level of student argumentation (Wahdan et al., 2017). The ability of each student to argue is still very weak so development at the argumentation level is urgently needed, the low ability to argue from students is due to the very low ability of basic concepts. The low ability of each student in conveying their arguments is caused by previous learning not providing adequate facilities for students to the fullest (Noer et al., 2020).

Correlation of Concept Understanding and Level of Argumentation in Grade IX Middle School Students, Grade VII Middle School Students and Grade VI Elementary School Students

The results of the study stated that there was a correlation between conceptual understanding and the level of student argumentation in elementary school students, class VII junior high school students and class IX junior high school students. Overall, there was no correlation between understanding of concepts and the level of argumentation for students in class VI of SD, students in class VII of junior high school and students of class IX of junior high school because there was no harmony between understanding of concepts and level of argumentation of the students studied. The results of the analysis show that the understanding of concepts and the level of argumentation is not in harmony because the data and results of the analysis show that the number of correct answers from students related to understanding the concept is not in line with the level of argumentation. Previous research explained that there is a correlation between conceptual understanding and argumentation. However, not all students with high conceptual understanding have good argumentation skills (Noviyani et al., 2017). The correlation between understanding of concepts and the level of argumentation of sixth grade elementary school students, VII graders of junior high school and IX graders of junior high school can be seen in Table 8.

Table 8. Conceptual Understanding of Argumentation Levels

Level	Level argumentation (%)			
	L-1	L-2	L-3	L-4
Elementary class VI students	25	28	48	0
Grade VII junior high school students	27	29	44	0
Class IX junior high school students	28	16	56	1

Based on Table 7 it shows that the results of student work show that there are differences in answers at the argumentation level. The results of work and interviews show that students answer at level 3 higher, meaning that students who have understood the concept of magnets use the basis of thinking.

Findings in Research

Based on the results of the study that there are differences in understanding the concept of magnetic material in students of class VI SD, class VII SMP and class IX SMP. Grade VI elementary school students who had studied magnets experienced a decrease in their understanding of the concept of magnet material when they were in class VII of junior high school and when students were in class IX of junior high school and re-studied magnetic material their understanding of magnets increased again.

It was also found that there were different arguments from the 5 indicators of the concept of

magnetic matter, namely explaining the types, parts and functions of magnets (indicator 1), determining the poles of a magnet (indicator 2), analyzing the forces of attraction and repulsion (indicator 3), analyzing magnetic field (indicator 4) and design a way of making magnets (indicator 5) at each level. Grade VI Elementary School students learn magnetic materials using thematic books, they study both theory and practice, so Grade VI Elementary School students are only able to argue at level 3 and not higher because students are not trained enough to convey their reasons. The need for skills in conveying opinions individually so that students can use their knowledge in arguing. Unlike the seventh grade students of junior high school who had studied magnet material, they studied from home and mostly studied on their own. The book used when studying is an integrated science book, some students forget about magnetic material which is influenced by time retention where VII graders of junior high school have studied magnets in grade VI SD but no longer study in class VII SMP so students argue a lot at levels 1 and 2 and a little argument at level 3. Class IX SMP students are back to learning theory and practice about magnetic material sourced from integrated science books and well guided by the teacher so that grade IX SMP students are able to argue at level 1, level 2, level 3 and level 4 Students learn from several sources and students are given the opportunity to use their knowledge to convey reasons. The findings also showed that there were differences in the level of student argumentation in private and public schools. The level of argumentation of students in private schools is more argumentative at level 3. Based on observations, researchers found that private students have very high discipline. Discipline of learning in the learning process has a role to regulate and condition students to be truly ready to accept learning (Aji, 2018). As also emphasized by Airey & Linder, (2009) that students who have learning discipline will affect learning outcomes. It was also found that students who attend private schools also learn magnetic material from several sources and are not fixated on one source. Various sources are needed by students in order to develop students' argumentation abilities. Students can multiply sources to increase the level of argumentation (Haruna & Nahadi, 2021).

Implications for Learning in SD and SMP

The importance of this finding for teachers who teach science in elementary and junior high schools is that by analyzing concept understanding and the level of argumentation in science learning, teachers can find out the extent to which students' ability to understand concepts and levels of argumentation so that teachers can improve learning activities by using appropriate learning models because science material places more emphasis on practicum. Science learning in elementary and junior high schools requires a learning process that is more meaningful, interesting, fun and whole so that students can understand science concepts well (Pratiwi et al., 2019). A good and optimal understanding of concepts in basic education will give students a strong memory so that up to a higher level students are able to give arguments to a higher level.

Conclusion

There are differences in understanding of the concept of magnets in class VI students who are currently studying magnets, there are differences in understanding of the concept of magnets in class VII students who have studied magnets in class VI and there are differences in understanding of the concept of magnets in class IX students who are currently studying magnets and have studied magnets in class VI. There were 22% of students in grade VI SD who answered correctly, there were 19% of students in class VII of SMP who answered correctly and there were 23% of students in class IX of SMP in terms of understanding concepts. There are differences in the level of magnetic argument in class VI students who are currently studying magnets, there are differences in the level of magnetic argument in class VII students who have studied magnets in class VI and there are differences in the level of argumentation in class IX students who are currently studying magnets and have studied magnets in class VI. There are several students who argue at level 4 in class IX junior high school. There is a low correlation between understanding of concepts and the level of argumentation of magnetic material in class VII SD students, there is a low correlation between understanding of concepts and level of argumentation of magnetic material in class VII students of junior high school and there is a very low correlation between understanding of concepts and level of argumentation of magnetic material in class IX of junior high school.

Author Contribution

This paper was written by three authors, namely Y.I.B, I.W.D, and W. All authors worked together in carrying out each stage.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

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