

## Analysis of the Nature of Science on the Thematic Book of Elementary School Fifth Grade Heat and Its Displacement

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**Abstract.** Learning science must make the nature of science a guide. Pouring the content of the nature of science is not only the teacher's responsibility in learning, but also the nature of science must be included in the textbooks. There are three aspects/components of the nature of science that must fit in book's text readers, namely: (1) Products; (2) Process; and (3) Attitude. This research method uses descriptive research with content analysis. With the object of study, the thematic textbook document for the 2013 Class V Curriculum Integrated, Theme 6 is Heat and Its Transfer. The results showed that the nature of science was very well contained in the textbook, with a percentage of 100% on the aspects/components of Products and Processes and 55.5% on the parts elements factors characteristics/components of Attitude.

**Keywords:** Nature of Science, Thematic Books, Fifth Grade Heat and Its Displacement

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**INTRODUCTION** ~ Natural Sciences (IPA) or Science is an exact subject, which starts to be studied from elementary school to university level. It also has a vital role in preparing individuals to enter the world of their lives. Science education is directed to discover and act to help students gain a deeper understanding of the natural environment.

Based on the Regulation of the Minister of National Education (Permendiknas) Number 22 of 2006 concerning Content Standards (SI) that the scope of science study materials for SD/MI includes four aspects, namely:

1. Living things and life processes, namely humans, animals, plants and their interactions with the environment and health.
2. Objects or materials, their properties and uses include liquid, solid and gas.
3. Energy and its changes include: force, sound, heat, magnetism, electricity, light and simple machines.

4. Earth and the universe include soil, earth, solar system, and other celestial bodies (Ministry of National Education).

Science education has the aim of providing the ability to use science to understand natural phenomena, deal with social changes and debates that occur in the world, and so that students have an awareness of scientific literacy, which is manifested through the nature of science (Lederman, Lederman, & Antink, 2013).

Learning Natural Sciences (IPA) or Science also plays a role in shaping the personality and intellectual development of students (Intika & Jumiati, 2020) and learning science in elementary schools should be able to open opportunities to foster student curiosity scientifically (Samatowa, 2016). So that learning helps students develop the ability to ask questions and seek answers based on

evidence and develop scientific ways of thinking.

Understanding the nature of science or the Nature of Science (NOS) is essential in learning science. An understanding of NOS will provide background detailing how science and scientists work. Understanding how scientific knowledge is created, validated, and influenced (McComas W., 2015). This shows the importance of including NOS elements in school science programs (McComas & Nouri, 2016). The meaning of the importance of NOS leads to the scientific literacy ability of every member of society in this world when finding problems, in socio-scientific issues, for example, to achieve logical problem solving (Widodo, Jumanto, Adi, & Imran, 2019).

In addition, understanding and teaching the nature of science (NoS) is an essential part of scientific literacy and the focus of science education worldwide (Eastwood, Sadler, Lewis, & Amiri, 2014). An adequate understanding of the nature of science (NOS) is also a central component of scientific literacy (El-Kholick & Ledernan, 2014). Understanding the nature of science (NoS) also helps understand scientific phenomena and technological processes in everyday life. It is essential for decision making on social-scientific issues, especially in modern society (Aflalo, 2015). Mainly, science/science learning is based on essentially talking about three main things: science as a product, science as a process, and scientific attitude science (Sardinah, Tursinawi, & Novianty, 2012).

In fact, in the field, the nature of science is not stated in its entirety besides because teachers do not understand the concept of

the nature of science well, science content is rarely the focus of research (Hansson, Leden, & Thulin, 2020). And so far, it is not taught as teaching material in schools in Indonesia (Adi & Widodo, 2018). At the same time, an understanding of the nature of science is something important in learning science.

An understanding of scientific attitudes will provide a background detailing how science and science work. Next, an understanding of how scientific knowledge is created, validated and influenced (McComas, 2015). From there, it shows the importance of incorporating elements of the nature of science in science learning programs in schools (McComas & Nouri, 2016).

Science learning which only teaches facts, concepts, principles, laws, and theories, has not taught science. In teaching science, teachers should also train students to process (process skills) and instil scientific attitudes, such as curiosity, honesty, hard work, unyielding, and openness (Widodo & Wuryastuti, 2007).

The results of other studies state that one of the factors that causes the low scientific literacy skills of Indonesian children is related to how the nature of science is presented in textbooks (Putri, 2017). From this, it is illustrated that complete science learning is not only the teacher's responsibility but must also be stated in the textbook.

Books are an essential component in teaching and learning activities—textbooks or books (the meaning of textbooks). The use of science textbooks at the elementary school level is considered to have a somewhat important position. Textbooks are used as

guidelines by teachers in elementary schools in the learning process. Currently, with the stipulation of the 2013 curriculum, the government has produced two books that are used in the teaching and learning process at the elementary school level, namely student books and guide books for teachers. A teacher should understand aspects of scientific literacy first before implementing the learning process. To help students understand the Nature of Science, a good science teacher will consider pouring NOS throughout his teaching. This understanding of NOS is fundamental in education to improve students' scientific abilities (Widodo, Jumanto, Adi, & Imran, 2019).

NOS-oriented learning results in students understanding the process of inquiry and knowing that science is a guide to logic and imagination and explains and predicts facts, but not being authoritarian. They will understand that science is a complex social activity (Subari, Rahayu, & Marfu'ah, 2016). Therefore, this study will analyze how aspects of the nature of science are contained in science textbooks. In class V thematic book, theme 6, heat and its transfer material. This theme is divided into four sub-themes: sub-theme one temperature and heat, sub-theme two transfer of heat around us, sub-theme three the influence of heat on life, and sub-theme four literacy. Then each sub-theme is divided into six lessons.

## METHODS

This type of research uses descriptive analysis research design, with the research method design using content analysis. The object of this research is the Integrated Thematic textbook document.

Primary school. Class V, Theme 6 Heat and Its Transfer. The research method was chosen to answer the research objective, namely to find out the content of the nature of science in science teaching based on the Integrated Thematic Curriculum 2013 published by the Minister of Education and Culture.

The data collection instrument used in this study was a document observation sheet which was developed based on three aspects/components of the nature of science, namely: (1) science as a product; (2) science as a Process; and (3) science as attitude).

The data collection procedures in this study were:

1. Carrying out a literature review on three aspects/components of the nature of science and classifying the content of science material contained in the Integrated Thematic book, grade 5, Theme 6, Heat and Transfer Materials.
2. Identify the content of the aspects/components of the nature of science contained in the 5th-grade Integrated Thematic book, Theme 6 of Heat Matter and Its Transfer.
3. Calculating the value and percentage of the content of the Nature of Science in Science Materials contained in the 2013 Integrated Thematic Class 4-6 book.

Data analysis was carried out by grouping the material based on sub-themes and learning, then describing and drawing conclusions. First, the percentage level of the content of the aspects of the nature of science contained in each Scope of Science Learning is described to understand the meaning of each existing data. Then conclusions are drawn from the research

results. The description of the level of content of the nature of science within the scope of science contained in this Thematic book is done by comparing the percentage of observations on each aspect observed based on the existing

categories. This description process is also linked and strengthened with the results of previous research carried out. The categories of criteria for the percentage level of science footers are listed in the following table.

**Table 1.** Criteria for the percentage level of the essence of science

Percentage	Category
81-100	Very good
61-80	Good
41-60	Enough
21-40	Not enough
≤20	Very less

## RESULTS

Based on the research carried out, the aspects/components of the nature of science are contained in the 2013 Curriculum Integrated Thematic book, class V, Theme 6, Heat and Transfer

material. Which in the theme book, there are four sub-themes; each sub-theme is divided into six lessons. However, theme four is only a literacy activity for students, so the analysis is carried out on themes one, two, and three.

**Table 2.** Analysis of the Nature of SCIENCE in the Integrated Thematic book, Theme 6 Heat and Its Transfer

Aspect	SUBTEMA			Aspect Average
	1 (%)	2 (%)	3 (%)	
Product	100	100	100	100
Process	50	50	66,6	55,5
Attitude	100	100	100	100
Load Average	83,3	83,3	88,8	

Information:

1. Temperature and heat
2. Heat transfer around us
3. The effect of heat on life

## DISCUSSION

Based on the analysis results drawn from the results of the table above, it shows that the Nature of Science in the 2013 Curriculum Integrated Thematic Textbooks can be said to be VERY GOOD. This can be seen from the content of the

nature of science contained in the textbook. The content of the essence of science in the student's textbooks is found in aspects/components of products and attitudes, while aspects/components of attitude are only in percentages which can be said to be ENOUGH.

From the results of this analysis, at least it gives an idea that the Integrated Thematic textbook is an excellent book to be used as teaching material for learning because it

already contains the nature of science in it. Moreover, an excellent textbook will undoubtedly encourage student learning outcomes because science education aims to develop scientific literacy, which means that the level of competence in understanding and using science is essential to function effectively as members of society (Harlen & Qualter, 2004). This is also the realization of gaining great attention to the nature of science (NOS) in science curricula and policies worldwide (Yacoubian, 2015).

The three aspects/components of the nature of science are described in-depth as follows: Science is not only knowledge about nature presented in the form of facts, concepts, principles or laws (IPA as a product), but also a way or method to know and understand natural phenomena (IPA as a product). As a scientific process) and efforts to cultivate a scientific attitude (IPA as a scientific attitude). The three components are one unit and must exist in science learning (Sardinah, Tursinawi, & Novianty, 2012).

## CONCLUSION

The results of this study indicate that the level of content of the nature of science in the 2013 Integrated Thematic Curriculum book, class V, Theme 6 Heat and its Transfer, which in the integrated thematic book is divided into four sub-themes and each sub-theme is divided into six lessons, can be categorized very well. For example, the highest percentage on aspects/components of products and processes is 100% and attitude aspects of 55.5%. This illustrates that the 2013 Curriculum Integrated Thematic book used today has described the nature of science in science learning. This will help

students know science well and grow science values well.

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