

Analysis of the Nature of Science in Grade 4 Student Books Theme 4 “Various Jobs” Published by the Ministry of Education and Culture 2017 Revised Edition

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ABSTRACT

The purpose of this study is to describe the content level of the nature of science as a product, process, and attitude contained in the student science book Grade 4 Theme 4 “Various Jobs” published by the Ministry of Education and Culture 2017 Revised Edition. This research is qualitative, using a content analysis research design. The technique of data collection is through documentation using analysis sheets as the instrument. The data analysis was carried out through data collection, data reduction, content analysis of the nature of science as a product, process, and attitude by giving scores according to indicators, percentage calculation and result qualification, analysis result description and evidence inclusion, and, conclusion drawing from the results. Data validity was examined using a credibility test by increasing persistence, peer checking, and theory triangulation. The results of this study are as follows: (1) The content level of the nature of science as a product in student books was 41%, which is a fairly good category. (2) The content level of the nature of science as a process in student books scored 39%, which is in the fairly poor category. (3) The content level of the nature of science as an attitude in student books obtained 75%, which is categorized as good. Student Book Grade IV Theme 4 “Various Jobs” published by the Ministry of Education and Culture in the 2017 revised edition has cultivated the nature of science as a product, process, and attitude in learning. However, the preparation of science content that is following the nature of science was not completely flawless, leaving shortcomings that should be managed.

Keywords: *analysis, student books, the nature of science*

1. INTRODUCTION

Science learning is learning that is directly related to everyday life. Science is closely related to events that have been carried out by humans. Therefore, science learning in every level of education is always available from the elementary, junior high, high school levels. Although science learning exists at every level of education, students' ability in Indonesia is somehow poor in this regard. As quoted from the Liputan 6.com report by Kurnia (2019) [1] states that Indonesia's ranking based on the evaluation by PISA (Program for International Student Assessment) for the last four years has decreased. Based on the PISA report which was recently released on 3 December 2019, students' science ability ranked 70 out of 78 countries. The reason for the low score can be

determined from several aspects. Aisah (2020) [2] expresses that students' interest in learning science remains low because (1) science material is taught to be memorized; (2) the learning process is limited to the textbook; (3) learning media is insufficient; (4) teaching methods are unattractive and teachers' professional competence is poor. Students at the elementary school level experience difficulty in learning science due to various factors. According to Khoir in Awang (2015) [3], there are many foreign terms, the material is too dense, it demands students to memorize the material, there are limited learning media, students find it difficult to understand the material due to the lack of available media, teachers dominate learning process, teacher's material mastery is poor, and the class is monotonous.

To this day, students perceive natural science as limited to knowledge obtained from reading books. Whereas science learning is a branch of science that answers phenomena in nature or the surrounding environment. In line with the opinion of Trefil and Hazen in Awang (2015) [3], science is a way of questioning and answering the physical universe. In the implementation of the 2013 curriculum, science content is integrated with other content. However, science learning needs to be enforced by highlighting the provision of direct experience and inquiry so that students can understand and explore the natural surroundings in-depth and scientifically. According to Tursinawati & Widodo (2019) [4], the attention of scientists to science continues to grow over time because the nature of science is the process by which a person acquires knowledge so that he can understand scientific concepts correctly through various systematic stages so as to produce the desired findings. Science learning must contain the characteristics contained in three aspects of the nature of science, namely science as a scientific product, scientific process, and scientific attitude.

According to Sayekti (2019) [5], the nature of science as a scientific product is a collection of research results carried out by scientists and has formed a concept that has been studied as an empirical and analytical result. The form of science as a product is facts, principles, laws, and scientific theories. The nature of science as a process is a process of exploring and understanding natural science. Science is not only a collection of facts and concepts but also a process of finding facts and theories that will be summarized by scientists. The process of understanding science is called science process skills. Science process skills are divided into two, basic process skills and integrated process skills. According to Desstya (2015) [6], science process skills are skills that become the driving force and development of facts and concepts as well as the growth and development of attitudes and values. These skills are often used by scientists in the research process, including (1) observing, which encompasses counting, measuring, classifying, and finding the relationship of space/time; (2) formulating a hypothesis; (3) planning research/experiments; (4) controlling variables; (5) interpreting data; (6) drawing temporary conclusions/inferences; (7) predicting; (8) applying; (9) communicating. Furthermore, according to Sayekti (2019) [5], the nature of science as a scientific attitude should be exerted when carrying out the science learning process, for example, curiosity, honesty, objectivity, critical, open, disciplined, meticulous, and so on.

Textbooks are an important learning instrument in teaching and learning activities. Sovic & Hus (2016) [7] state that textbooks are one of the school's main instruments in learning so it is essential to adapt them to the cognitive development of children at a certain age. Textbooks are also used as a learning resource for

students and teachers. Rusman in Dewi (2019) [9] suggests that learning resources are anything outside of a person that can be useful to facilitate the learning process in any form, any object which can help the learning process, then the object is defined as a learning resource.

In the 2013 curriculum, learning resources have been provided by the government in form of learning textbooks that are deemed eligible. In the 2013 curriculum, learning resources used as a guide for students are called referred to as student books. Student books integrate several contents into a theme and it is also termed thematic books. Apart from different terms of textbook in learning, their function is certainly the same as a reference for learning. Roseni in Novianto & Mustadi (2015) [10] view textbooks as an effective learning resource because they provide learning that can be used by teachers, a source of ideas and activities, a reference source for students, a syllabus that reflects objective learning and facilitates inexperienced and unassertive teachers. Chailee and Britain in Clucas (2018) [11] reveal that for science subjects to be useful for elementary students, learning activities should focus more on scientific work exercises than the delivery of scientific knowledge. If science learning contains more scientific work training, this will can certainly be useful in the daily lives of students to answer phenomena that occur in nature or the surrounding environment. Therefore, it is necessary to provide textbooks, in this case, student books according to the nature of science. Student books used in learning the 2013 curriculum have an important position and function as guidelines in carrying out learning. Thus, it is important to emphasize aspects of the nature of science.

Various studies have been carried out by researchers in analyzing the nature of science, including Sayekti et al., (2019) [5] which obtained results in the form of deficiencies related to the nature of science in the student book grade 4 theme 3 if the 2013 curriculum revised edition 2017. The nature of science as a product is still limited to facts, principles, and concepts. Meanwhile, the nature of science as a process is still limited to certain aspects. Fundamentally, science as an attitude is more complete. In addition, research conducted by Sardinah et al., (2012) [12] found that the basic ability of students in mastering the concept of the nature of science in elementary schools was still low, obtaining 40%. This occurred because the nature of science was new and the teacher's mastery ability on the concept of science was poor. Aisah (2020) [2] found that the level of teacher understanding related to the nature of science, in theory, obtained a mean score of 4.67, which is in the poor category, yet in the learning process the teacher had carried out the process skills in science learning.

Based on the research results of the nature of science, it has been carried out on one type of student book grade 4 theme 3 of the 2013 curriculum revised edition 2017

and teacher understanding level of teachers and students in elementary schools. This indicates that the analysis carried out on the book entails some drawbacks so research on the book should be continued. This becomes the motive to conduct an in-depth analysis of the nature of science in the student book Grade 4 Theme 4 “Various Jobs” published by the Ministry of Education and Culture in revised edition 2017.

2. METHOD

This study applied a qualitative approach with a research design using content analysis to describe the results of the book analysis so it can be presented objectively, systematically, and communicatively. The data source is the subject of research, which is the Student Book Grade 4 Theme 4 “Various Jobs” published by the Ministry of Education and Culture revised edition 2017. Meanwhile, the object in this study is the scope of the nature of science as a product, process, and scientific attitude.

Data validity testing administered a credibility test by intensifying persistence, through reading reference books, research results, or documentation related to the findings. To obtain objective analysis results, an examination was carried out with colleagues or experts in their fields to assist researchers in generating supplementary data and comparative material on the results of the analysis. Furthermore, to avoid any researcher bias, comparisons were made with relevant theoretical perspectives from various existing experts using theoretical triangulation.

This research instrument is in the form of an analysis sheet comprising indicators of the nature of science adapted from various previous research results. The stages of book analysis consist of: (1) data collection by means of documentation studies, (2) data reduction, (3) student book analysis related to the nature of science as a product, process, and scientific attitude by giving scoring on the analysis sheet guidelines, (4) percentage calculation obtained from book analysis using the formula: $NP = \frac{NP}{N} \times 100\%$, (5) qualification determination of acquired percentage, (6) data description and detailed evidence inclusion, (7) conclusion drawing from the results of the analysis of the nature of science as a product, process, and scientific attitude contained in the book.

3. RESULTS AND DISCUSSION

Based on the analysis that has been done on the Student Book Grade 4 Theme 4 “Various Jobs”, in terms of the scope of nature of science, the percentage results are presented in Table 1.

Table 1. Analysis Results of the Nature of Science

Nature of Science as Product	Percentage	Qualification
Fact	41%	Fairly good
Concept		
Law		
Principle		
Theory		
Nature of Science as Process	Percentage	Qualification
Observation	39%	Fairly poor
Hypotheses formulation		
Research/experiment planning		
Variable control		
Data interpretation		
Conclusion drawing/inference		
Prediction		
Application		
Communication		
Nature of Science as Attitude	Percentage	Qualification
Honest, open to new ideas, responsible, objective, cooperative, critical thinking, curiosity, introspection, discipline, awareness, or care for the environment	73%	Good

The nature of science as a product, the percentage was 41%, which is in the fairly good category. This aspect was found in each sub-theme in lessons 1 and 3. The content of the nature of science as a product was limited to facts, concepts, and principles while laws and theories did not appear.

In the aspect of the nature of science as a process, the percentage obtained was 39%, securing a place in the fairly poor category. This aspect is contained in each sub-theme in learning 1 and 3. The nature of science as a process is limited to observing, making hypotheses, planning experiments, interpreting data, drawing conclusions, predicting, implementing, communicating,

while in activities controlling variables and applying/applying has not appeared.

In the aspect of the nature of science as an attitude obtained a percentage of 75% in the fairly poor category. This aspect was found in each sub-theme in lessons 1 and 3. The content of the nature of science as an attitude is complete within the book, the cultivation of attitudes that emerged are honest, responsible, objective, cooperative, critical thinking, curiosity, introspection, awareness or care for the environment, openness to new ideas, and discipline.

The content of science in the Student Book Grade 4 Theme 4 "Various Jobs" published by the Ministry of Education and Culture in the revised edition 2017 regarding the nature of science was observed in each sub-theme in lessons 1 and 3. Basic Competencies (*Kompetensi Dasar/KD*) of science learning in Theme 4 encompass 3.8 Explain the importance of efforts to counterbalance and preserve natural resources in the environment; 4.8 Conduct activities to conserve natural resources with the surrounding community. To analyze the nature of science in the student book, researchers identified materials according to the indicators of the nature of science contained therein. The scope of the nature of science in every aspect of the student book is described as follows:

3.1 The nature of science as a product

The nature of science as a product is a collection of products by scientists for centuries from experiences and analytical processes that have been carried out. Aspects of the nature of science as a product include

3.1.1. Facts

This was found in sub-theme 1, sub-theme 2, and sub-theme 3 in lessons 1 and 3. Some of the findings are presented in Figure 1, Figure 2, Figure 3, and Figure 4.

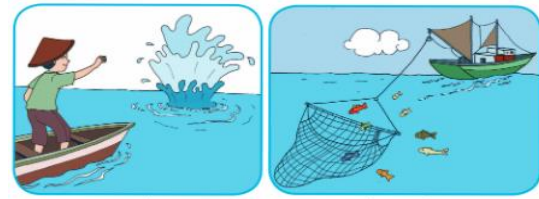
Perhatikan fakta tentang manfaat bakau berikut! Lalu jawablah pertanyaan!

1. Melindungi pantai dari erosi dan abrasi. Adanya bakau di pesisir pantai bermanfaat untuk menjaga agar garis pantai tetap stabil dan tidak terkikis oleh terpaan ombak. Rumpun-rumpun bakau mampu menyerap energi gelombang yang datang sehingga hanya riak gelombang yang sampai di sisi pantai.
2. Menahan rembesan air laut ke darat.
3. Sebagai perangkap zat-zat pencemar dan limbah industri. Selain dapat menjaga daratan, bakau juga memiliki peran penting dalam mengurangi polutan di air laut.
4. Menciptakan udara pesisir yang bersih dan segar. Daun bakau dapat menyerap gas karbondioksida dan melepaskan oksigen ke lingkungan. Dengan demikian, udara di sekitar pantai tetap bersih dan segar.
5. Menjadi habitat alami berbagai biota darat dan laut. Kelestarian hewan laut dan darat seperti udang, kepiting, berbagai jenis ikan, burung, monyet, serta biawak terjaga dengan adanya hutan bakau di pesisir pantai.
6. Mengurangi dampak bencana akibat gelombang laut, seperti badai dan gelombang pasang.

Figure 1. Fact in Sub-theme 1 Lesson 1

Aku cukup sedih melihat sekarang ini banyak yang menangkap ikan dengan pukot harimau dan bahan peledak.

Pukat harimau adalah jaring sangat besar yang dapat menjangkau semua makhluk hidup laut.



Bom ikan adalah bahan peledak untuk menangkap ikan. Cara ini dapat menyebabkan hancurnya terumbu karang dan habitat ikan.

Figure 2. Fact in Sub-theme 2 Lesson 1

Seiring perkembangan zaman, saat ini dibuat pensil yang merupakan campuran dari grafit dan tanah liat. Proses pencampuran ini dibalut oleh media kertas atau kayu. Cara membuat pensil saat ini adalah dengan menghancurkan grafit dan tanah liat menjadi bentuk bubuk, kemudian dibakar selama kurang lebih 3 hari. Setelah itu, pensil ini dibentuk panjang dan tipis serta dibungkus kayu.

Figure 3. Fact in Sub-theme 2 Lesson 3

Yahku mendapatkan kayu untuk bahan baku mebel dari hutan. Salah satu hutan di Indonesia yang sering diambil pohonnya adalah hutan di Kalimantan. Dahulu hutan Kalimantan sangat lebat dan merupakan paru-paru dunia (penghasil oksigen). Akan tetapi, kini pohon-pohonnya semakin berkurang. Sering sekali karena kebakaran hutan.

Figure 4. Fact in Sub-theme 3 Lesson 1

Figures 1, 2, 3, and 4 are facts since they can be proven objectively by others. Figure 1 is a fact that presents information on the various benefits of mangroves. This is a fact because mangroves have strong and sturdy roots, and they can be used immediately by people living in coastal areas to protect beaches from erosion and abrasion, to prevent seepage of seawater to land, to trap pollutants and industrial waste release clean and fresh coastal air, to become a natural habitat for various land and marine biota, to reduce the impact of disasters posed by ocean waves, such as storms and tidal waves. Figure 2 is a fact that presents unethical human behavior towards the environment that fishing using tiger trawls and fish bombs. This becomes a fact because when someone else does this action, it can harm the marine ecosystem, destroying coral reefs and fish habitats.

Figure 3 is a fact that presents information on the manufacture of pencils using graphite and clay. This is a fact because when the pencil is crushed, there is a mixture of graphite and clay wrapped in wood inside. Figure 4 is a fact that provides information on the saddening situation in Kalimantan forest. This becomes a fact because looking at the condition of forests in Kalimantan today, the number is significantly decreasing. As reported by Kompas.com, the forests in Kalimantan are indeed experiencing decline but there are some new spots for forestation as well. This was conveyed by the Head of the National Institute of Aeronautics and Space (LAPAN). Chiappetta & Koballa (2010) [13] that facts represent what we can see through reason and are deemed reliable or trustworthy data.

3.1.2 Concept

Found in sub-theme 1, sub-theme 2, sub-theme 3 in lessons 1 and 3, some are presented in figures 5, 6, 7, and 8.

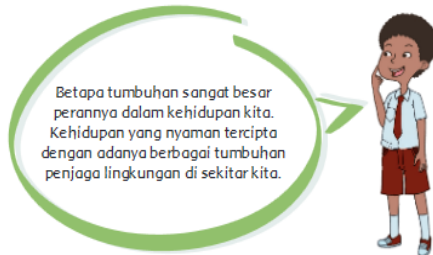


Figure 5. Concept in Sub-theme 1 Lesson 1



Tahukah kamu siapa yang bekerja agar lingkungan tetap terlindungi? Ya, mereka adalah pencinta lingkungan. Mereka adalah orang-orang yang bekerja untuk melindungi lingkungan tanpa imbalan atau bayaran. Pencinta lingkungan bekerja di berbagai wilayah. Kamu juga bisa menjadi seperti mereka.

Tugas pencinta lingkungan ini adalah menjaga lingkungan dari kerusakan dan pencemaran akibat ulah manusia.

Kamu dapat menjadi bagian dari mereka yang peduli terhadap lingkungan. Buatlah rencana kegiatan agar sumber daya alam di sekitarmu terjaga! Pilihlah paling sedikit dua sumber daya alam yang ada di sekitarmu! Rencanakan tiga kegiatan untuk menjaganya!

Figure 6. Concept in Sub-theme 1 Lesson 3

Pernahkah kamu berpikir bagaimana para pekerja pembuat pensil? Pensil awalnya adalah sebuah alat tulis dan lukis yang terbuat dari grafit murni atau karbon yang berasal dari alam. Sayangnya, grafit murni cenderung rapuh dan mudah patah.

Kayu yang telah ditebang untuk pembuatan pensil berasal dari pohon. Benda-benda lain yang terbuat dari kayu juga berasal dari pohon. Agar terjaga kelestariannya, pohon yang ditebang harus diganti dengan menanam kembali bibit baru dari tanaman sejenis. Selain itu, kita harus menghemat penggunaan pensil sebagai salah satu cara menghargai lingkungan.

Figure 7. Concept in Sub-theme 2 Lesson 3

Ayahku mendapatkan kayu untuk bahan baku mebel dari hutan. Salah satu hutan di Indonesia yang sering diambil pohonnya adalah hutan di Kalimantan. Dahulu hutan Kalimantan sangat lebat dan merupakan paru-paru dunia (penghasil oksigen). Akan tetapi, kini pohon-pohonnya semakin berkurang. Sering sekali karena kebakaran hutan.

Figure 8. Concept in Sub-theme 3 Lesson 1

Figures 5, 6, 7, and 8 are a concept because they have five elements. Chiappetta & Koballa (2010) [13] states that the concept has five important elements, including name (label), definition, attribute (specific feature), example, and value. In Figure 5, the concept plants. Plants have names, plants are defined as living things with cell nuclei containing chlorophyll, plant attributes are roots, stems, and leaves, the examples are trees and plants, and the value of plants is their role as absorbers of carbon dioxide and converting it into oxygen which can be useful for living things surround them, and therefore the environment becomes fresh. In addition, plants can also be consumed and protect us from the sun. In Figure

6, the concept is the environment. The environment has a name, the definition of the environment is anything around human beings and affects life. Environmental attributes are biotic and abiotic components, the examples are soil, water, sunlight, plants, and animals. The value is its role as a place for activities, in which they are important elements for the survival of living things.

In Figure 7, the concept is a pencil. Pencil has a name, the definition of a pencil is a writing and drawing tool made of graphite wrapped in wood. The attributes of a pencil are graphite and wood, the examples are standard graphite pencils and colored pencils. The value of pencils is their role in writing and drawing. Regardless of the time change, the use of pencils for students and painting artists is still maintained. In Figure 8, the concept is forest. Forest has a name, forest is defined as land dominated by dense trees. Attributes of the forest are air humidity and numerous vegetation. The value is to act as a producer of oxygen and absorb carbon dioxide, as a place to various kinds of flora and fauna.

The concept is an abstraction of events, objects, or phenomena that have certain properties or general attributes [13]. Anderson & Krathwoh in Suhartono et al., (2019) [14] states that the purpose of presenting the concept is for students to understand the concept and they can interpret, give examples, classify, summarize, draw conclusions, compare, and explain.

3.1.3 Principle

This is found in sub-theme 1, sub-theme 2, and sub-theme 3 of lessons 1 and 3. Some of them are presented in Figure 9, Figure 10, Figure 11, and Figure 12.

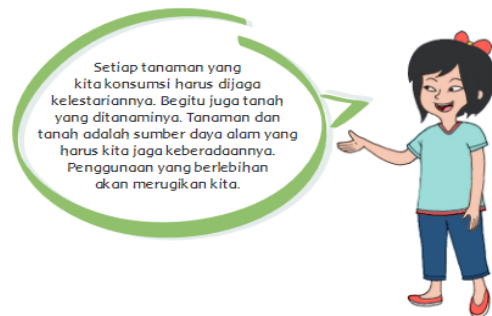


Figure 9. Principle in Sub-theme 1 Lesson 1

Pernahkah kamu berpikir bagaimana para pekerja pembuat pensil? Pensil awalnya adalah sebuah alat tulis dan lukis yang terbuat dari grafit murni atau karbon yang berasal dari alam. Sayangnya, grafit murni cenderung rapuh dan mudah patah.

Kayu yang telah ditebang untuk pembuatan pensil berasal dari pohon. Benda-benda lain yang terbuat dari kayu juga berasal dari pohon. Agar terjaga kelestariannya, pohon yang ditebang harus diganti dengan menanam kembali bibit baru dari tanaman sejenis. Selain itu, kita harus menghemat penggunaan pensil sebagai salah satu cara menghargai lingkungan.

Figure 10. Principle in Sub-theme 2 Lesson 3

Barang-barang yang kita butuhkan merupakan hasil dari suatu pekerjaan. Beberapa pekerjaan yang menghasilkan barang antara lain petani, peternak, nelayan, dan perajin. Selain pekerjaan yang menghasilkan barang, ada juga pekerjaan yang menghasilkan jasa atau pelayanan, seperti dokter, polisi, guru, dan pemangkas rambut (tukang cukur).

Barang-barang yang dihasilkan dari setiap pekerjaan sangat beragam. Banyak diantaranya yang memanfaatkan sumber daya alam di Indonesia. Sumber daya alam merupakan kekayaan alam yang diciptakan oleh Tuhan untuk kesejahteraan manusia.

Figure 11. Principle in Sub-theme 2 Lesson 3

Bacalah teks berikut dalam hati. Tahukah kamu cara lain pengolahan sampah?
Mengolah sampah bisa kita lakukan dengan berbagai cara.

Cara yang pertama, kita bisa mengurangi pemakaiannya. Istilah ini dikenal dengan nama *reduce* (mengurangi). Sebesar mungkin kita kurangi penggunaan kemasan barang. Semakin banyak kita menggunakan kemasan barang, semakin banyak sampah yang dihasilkan.

Cara yang kedua, kita bisa memakai kembali. Istilah ini dikenal dengan *reuse* (memakai kembali). Sebesar mungkin pilihlah barang-barang yang bisa dipakai kembali. Hindari pemakaian barang-barang yang disposable (sekali pakai). Hal itu dapat memperpanjang waktu pemakaian barang sebelum ia menjadi sampah.

Cara yang ketiga, kita bisa mendaur ulang. Istilah ini dikenal dengan *recycle* (mendaur ulang). Sebesar mungkin, barang-barang yang sudah tidak berguna lagi, bisa didaur ulang. Tidak semua barang bisa didaur ulang, namun saat ini sudah banyak industri yang memanfaatkan sampah menjadi barang lain.

Cara yang keempat, kita bisa mengganti ulang. Istilah ini dikenal dengan *replace* (mengganti). Teliti barang yang kita pakai sehari-hari. Gantilah barang-barang yang hanya bisa dipakai sekali dengan barang yang lebih tahan lama. Telitilah agar kita hanya memakai barang-barang yang lebih ramah lingkungan, misalnya ganti kantong kresek kita dengan keranjang bila berbelanja.

Figure 12. Principle in Sub-theme 3 Lesson 3

Figures 9, 10, 11, and 12 are deemed principles because they indicate a generalization or abstraction of the relationship between concepts. Figure 9 is a principle because it expresses the generalization of concepts of consumable plants that must be preserved. Figure 10 is a principle because it states the generalization of concepts of logs coming from trees, and objects made of wood coming from trees as well. To maintain the sustainability of forests, cut trees must be replanted with similar plants.

Figure 11 is a principle that signifies the concept of the relationship of usable goods that come from a job. Jobs that produce goods include farmers, ranchers, fishermen, and crafters. If the job is extinct, it will be challenging to purchase items necessary in daily life. Figure 12 is a principle because it states the concept of the relationship of processing waste that can be undergone in various methods, namely reduce, reuse, recycle, and replace. Waste management can minimize the amount of waste worldwide. If this is left unconcerned, it will affect environmental conditions. Moreover, the use of plastic waste is very large and this type of waste consumes time to decompose. So the correct way to solve the problem of waste in the world is to handle it to show how to take care of the environment.

The principle is a generalization or abstraction of the relationship between scientific concepts [5]. Principles fall into the general category of concepts. Although it is

considered broader than simple concepts, principles are high-level ideas to explain phenomena and patterns in nature [13].

Based on the results of the analysis of the nature of science as a product in student books, there were no legal or theoretical aspects. Meanwhile, the law has an important role, such as product and tool of science that has been scientifically proven.

Stefanidou & Skordoulis (2017) [15] state that laws are constructed by scientists, which describe many aspects of the world and can be amended if new theoretical or experimental data appear. Theory is a generalization of related principles and can be used to explain natural phenomena. Theories can change if there is new evidence that contradicts the theory [5].

3. 2 Nature of Science as a Process

The nature of science as a process is a skill/ability that is applied in research activities in form of ways of working, thinking, and solving problems. The nature of science is a process in the form of activity observation, hypotheses formulation, research/experiment planning, variable control, interpretation, conclusion drawing or inferences, prediction, application, and communication. These activities can be seen in sub-theme 1, sub-theme 2, sub-theme 3 of lessons 1 and 3, some of which are presented in figures 13, 14, 15, and 16.

Mengapa kita harus menjaga kelestarian tanaman bakau?

Apa yang terjadi jika hutan bakau rusak?

Bagaimana hutan bakau dapat menjaga keseimbangan alam? Jelaskan!

Apa saranmu agar hutan bakau tetap lestari?

Diskusikan hasilnya dengan teman sekelasmu!

Figure 13. Process activity in Sub-theme 1 Lesson 1

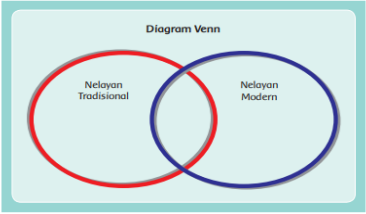
Pilihlah salah satu kegiatan yang memungkinkan bagi kamu untuk melakukannya! Tulislah laporanmu! Laporan harus memuat dua sumber daya alam yang dipilih, kegiatan untuk menjaganya, alat yang dibutuhkan, dan rencana selanjutnya.

Diskusikan jawabanmu dengan teman sekelompokmu!

Figure 14. Process activity in Sub-theme 1 Lesson 3

Jawablah pertanyaan berikut!

1. Apa yang digunakan oleh nelayan tradisional untuk menangkap ikan?
2. Apa yang digunakan oleh nelayan modern untuk menangkap ikan?
3. Tulislah persamaan dan perbedaan dari nelayan modern dan tradisional dalam diagram Venn berikut!

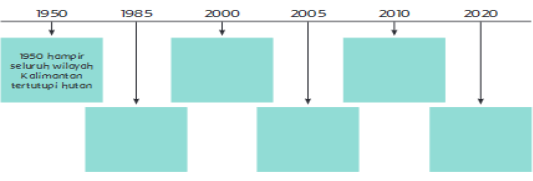


4. Menurutmu apa yang akan terjadi dengan laut jika semua nelayan menggunakan perahu besar dan perlengkapan modern?
5. Bagaimana seharusnya para nelayan mencari ikan supaya kelestarian ekosistem tetap terjaga?

Diskusikan hasilnya dengan kelompokmu!

Figure 15. Process activity in Sub-theme 2 Lesson 1

Menurutmu bagaimana perkembangan pohon yang ada di hutan Kalimantan dari tahun ke tahun? Diskusikan hasilnya dengan teman kamu.



1. Bandingkan kenampakan hutan pada tahun 1950 dan 2010.
2. Menurutmu, mengapa kenampakan hutan pada tahun 1950 dan 2010 sangat berbeda?
3. Bagaimana kondisi hutan jika terjadi penebangan terus-menerus?
4. Apa yang akan terjadi jika pohon di hutan semakin berkurang?
5. Apa yang harus kita lakukan untuk menjaga kelestarian hutan?
6. Sikap apa yang sebaiknya dimiliki oleh pengrajin kayu agar kelestarian hutan tetap terjaga?

Figure 16. Process activity in Sub-theme 3 Lesson 1

3.2.1 Observation

Figure 15 shows activities that require students to observe the similarities and differences between modern and traditional fishermen. Then students are asked to write it in the form of a Venn diagram. Through these

activities, students will recognize relevant details related to the data presented and identify similarities and differences between traditional and modern fishermen presented in the story. Osman (2012) [16] states that scientific observation includes actions in the form of employing several senses, looking at relevant details of objects and their surroundings, identifying similarities and differences, distinguishing the sequence of events happening, using sensory aids to learn details.

3.2.2 Hypothesis formulation

In Figure 13, some activities require students to create hypotheses based on the question "Why should we preserve mangroves?" Students are asked to explain and suggest temporary answers regarding the reasons for preserving mangroves. In making hypotheses, the answers given by students will vary so there is no demand to be identical, but what they convey should make sense based on the existing evidence in terms of scientific concepts and principles. This is in line with research conducted by Dessty (2015) [6] that making a hypothesis is the skill of predicting reasonable estimates to explain certain events or observations.

3.2.3 Research/experiment planning

Figure 14 shows activities that require students to plan research in the form of activities to protect natural resources in a possible way to do. Students are asked to choose activities to protect natural resources that are possible to do by writing on a report, which should contain the selected natural resources, activities to protect them, necessary tools, and further plans. In planning research, students and groups will discuss required tools and materials, activities to protect natural resources in their environment, and plans to achieve the research. This is in line with research conducted by Dessty (2015) [6] suggesting that in planning research/experimental activities, students should determine the tools and materials, object of the study, considered factors or variables, success criteria, steps, and record as well as process data to draw conclusions.

3.2.4 Interpretation

In Figures 15 and 16, some activities require students to interpret the data. In Figure 15, data interpretation is done by providing answers to the question "What do traditional fishermen use to catch fish? What do modern fishermen use to catch fish?" Students should answer questions based on information from the previous text regarding the differences between traditional fishermen and modern fishermen. Students answer based on conclusions - they determine a clear relationship pattern in the data. In Figure 16, data interpretation is in form of providing answers to the question "Compare the appearance of forests in 1950 and 2010? In your opinion,

why does forest in 1950 and 2010 appear so different?" Based on these questions, students should give their answers based on the interpretation of existing data related to the forest situation in Kalimantan from year to year. Students will analyze the existing information and then draw conclusions to give the correct answer. This is in line with research conducted by Sheeba in Hamadi et al., (2018) [17] that data interpretation refers to the organization and data analysis obtained from collecting information of an object and event that describes a particular situation, drawing conclusions by deciding clear relationship pattern in the data.

3.2.5 Conclusion Drawing /inferences

In Figures 13, 15, and 16, activities require students to draw conclusions. In Figure 13, conclusion drawing is performed by asking students to answer the question "How can mangrove forests maintain the balance of nature? Explain!" and "What do you suggest to keep mangrove forests sustainable?" Through these questions, students will make conclusions based on the previous learning regarding mangrove facts. Students explain mangrove forests that can maintain the balance of nature and propose suggestions for sustainable mangrove forests. In Figure 15, the conclusion drawing is shown by asking students to answer the question "How should fishermen catch fish so that the sustainability of the ecosystem is maintained?" With this problem, students will make conclusions based on what they have learned regarding the fishing method of traditional fishermen and modern fishermen. Students give suggestions to fishermen on how to do correct fishing methods so that the sustainability of the ecosystem can be maintained.

In Figure 16, the conclusion drawing is done by giving students the question "What should we do to preserve the forest? What attitude should woodworkers have in order to maintain forest sustainability?" Through these questions, students will propose conclusions based on what they have learned regarding the face of Kalimantan forests, which is increasingly concerning. Students will suggest steps to preserve the forest and the attitude woodworker should possess so that forest sustainability can be maintained. The activity of drawing conclusions will train students to make a practical conclusion for solving problems. Sulastiani in Hamadi et al., (2018) [17] states that making conclusion is a skill that should be possessed by students when learning finishes, deciding a state of objects or events concerned based on facts, concepts, and principles.

3.2.6 Prediction

In Figures 13, 15, and 16, activities require students to predict. In Figure 13, prediction is done by ordering students to provide answers to the question "What will happen if the mangrove forest is damaged?" The answers

given by students are based on predictions of the possibilities that may occur if the mangrove forest is damaged. Students provide answers based on their prior knowledge about what would happen or be found in the future if it happened. In Figure 15, the prediction activity asks students to answers this question based on their opinion "What do you think will happen to the sea if all fishermen use big boats and modern equipment?" Based on his predictions. Students provide answers based on their prior knowledge, what will happen in the future if all fishermen use big boats and modern equipment. This will train students to hypothesize but also relate to prior knowledge.

In Figure 16, the prediction orders students to answers question "How will be the forest be if there is continuous logging? What will happen if there are fewer trees in the forest?" based on their predictions. Students answers based on their prior knowledge, what will happen in the future if the forest is cut down incessantly. Predictions delivered by students are certainly very contrasting from the guess. If the guess is not necessarily justified in terms of hypotheses or evidence, it is different from predictions with criteria that are most likely to be justified. Osman (2012) [16] states that prediction includes actions in the form of utilizing evidence from past or present experiences to state what will happen, explicitly using patterns in evidence, justifying statements about what will happen or what evidence or experience will be found, exhibiting caution in making assumptions about the applied pattern.

3.2.7 Communication

In Figures 13, 14, 15, and 16, some activities require students to communicate. In Figure 15, communicating activity asks students to discuss the results of answers related to the mangrove preservation, which are obtained after selecting and sorting ideas to clarify the meaning and then conveyed to their peers. In Figure 14, the communication is shown when students discuss with their peers to discuss the report on the activity plan to protect the selected natural resources. Students share their opinions regarding the natural resources they want to protect in their environment. In Figure 15, communication asks students to discuss the results with a group of friends regarding the answers to questions about traditional and modern fishermen.

In Figure 16, communication demands students to discuss things related to the condition of trees in Kalimantan forest with their peers. Students share their opinions regarding the condition of Kalimantan forests from year to year. In the process of science, communication can be verbal and non-verbal which can assist them in presenting information efficiently. Osman (2012) [16] states that communication skills include: the ability to speak, listen, or write to select ideas and clarify meaning; make records of observations during

investigations; use graphs, charts, and tables to convey information; choose the proper means of communication.

Based on the results of the analysis of the nature of science as a process in the student book, there were no aspects of variable control and application. Whereas variable control is a skill that students can use to control and treat research variables [6]. Variables influence research, when students are able to control the variables, the activities will be more effortless. While the application is a skill that can be used to solve problems [6]. Science concepts that students have previously been mastered, will be applied in research activities and daily life.

3. 3 Nature of Science as Attitude

The nature of science as attitudes are scientific attitudes that emerge and are internalized when students participate in science learning through the scientific process carried out. This scientific attitude should always be accustomed so that students do not only apply this in learning but also in the daily environment they are expected to behave scientifically. Attitudes that arise during the science learning process include honesty, openness to new ideas, responsible, objective, cooperation, critical thinking, curiosity, introspection, discipline, awareness, and care for the environment. In textbooks, when students partake in the science learning process, scientific attitudes that emerge can be observed in sub-theme 1, sub-theme 2, sub-theme 3 in learning 1 and 3, some of which are presented in Figures 17, 18, 19, and 20.

Mengapa kita harus menjaga kelestarian tanaman bakau?

Apa yang terjadi jika hutan bakau rusak?

Bagaimana hutan bakau dapat menjaga keseimbangan alam? Jelaskan!

Apa saranmu agar hutan bakau tetap lestari?

Diskusikan hasilnya dengan teman sekelasmu!

Figure 17. Scientific attitude in Sub-theme 1 lesson 1

Ayo Membaca

Bacalah teks dengan membaca senyap!

Pernahkah kamu berpikir bagaimana para pekerja pembuat pensil? Pensil awalnya adalah sebuah alat tulis dan lukis yang terbuat dari grafit murni atau karbon yang berasal dari alam. Sayangnya, grafit murni cenderung rapuh dan mudah patah.

Seiring perkembangan zaman, saat ini dibuat pensil yang merupakan campuran dari grafit dan tanah liat. Proses pencampuran ini dibalut oleh media kertas atau kayu. Cara membuat pensil saat ini adalah dengan menghancurkan grafit dan tanah liat menjadi bentuk bubuk, kemudian dibakar selama kurang lebih 3 hari. Setelah itu, pensil ini dibentuk panjang dan tipis serta dibungkus kayu.

Kayu yang telah ditebang untuk pembuatan pensil berasal dari pohon. Benda-benda lain yang terbuat dari kayu juga berasal dari pohon. Agar terjaga kelestariannya, pohon yang ditebang harus diganti dengan menanam kembali bibit baru dari tanaman sejenis. Selain itu, kita harus menghemat penggunaan pensil sebagai salah satu cara menghargai lingkungan.

- Berdasarkan teks bacaan di atas, ceritakan proses pembuatan pensil dalam kolom berikut!
- Sumber daya alam apa yang digunakan untuk pembuatan pensil?
- Apa yang terjadi bila penggunaan pensil dan barang-barang lain yang terbuat dari kayu tidak dibatasi?
- Berikan saranmu agar dapat menggunakan pensil secara hemat sebagai salah satu cara untuk melestarikan lingkungan!

Figure 18. Scientific attitude in Sub-theme 2 lesson 3

Berikut adalah proses pengolahan kayu menjadi meja dan kursi.

Bersama dengan kelompokmu diskusikan pertanyaan berikut!

- Jelaskan proses yang terjadi sehingga meja dan kursi bisa sampai di rumahmu!
- Profesi apa saja yang terlibat agar meja dan kursi sampai di rumahmu?
- Termyata perjalanan meja dan kursi hingga bisa ada di rumahmu cukup panjang, ya. Bagaimana sebaiknya kamu merawat meja dan kursi di rumahmu?

Figure 19. Scientific attitude in Sub-theme 3 lesson 1

Ayo Renungkan

- Apa yang sudah kamu lakukan dengan sampah yang ada di rumahmu?

Kerja Sama dengan Orang Tua

Diskusikanlah dengan orang tuamu tentang sampah yang ada di rumahmu! Apa yang dapat kamu lakukan dengan sampah di rumahmu? Ceritakan kegiatan tersebut kepada gurumu!

Figure 20. Scientific attitude in Sub-theme 3 lesson 3

Figure 17 indicates activities that require students to perform scientific activities of hypothesis formulation, prediction, conclusion drawing, and communication. When students carry out these activities, it will automatically stimulate a critical thinking attitude, they

will attempt to solve problems. Besides, students also discuss answers which consequently will evoke the attitude of cooperation among students. Yuanita & Yuniarita (2018) [18] define critical thinking in science learning as the ability to solve problems, analyze, evaluate, and make decisions from the investigation results. Sari et al., (2020) [19] express that cooperation denotes the activity of a group of people to achieve a common goal. In the picture, there are also discussion activities that will train students to accept or decline new opinions/ideas from their peers. Lacap in Sarwanto (2021) [20] states that in the discussion, open-minded students can accept others' opinions regardless those opinions are different from theirs.

In Figure 18, some activities require students to carry out activities to read the passage of the pencil-making process and several questions require students to observe, predict, and communicate. When students carry out reading activities, it will automatically emerge curiosity regarding the contents of the text of the pencil-making process. Based on the picture, students will read comprehensively which will lead to an honest attitude since, in this kind of reading, it will be unknown who is reading or otherwise. Sarah et al., (2019) [21] state that honesty is one's attitude and behavior to be always trustworthy in words and actions. In addition, some activities raise an objective attitude, as shown by questions that require students to answer based on the previous text. Objective, to Sari et al., (2020) [19] is a view that placing everything according to its place, nature, and circumstances, presenting based on existing facts/data. In the picture, some activities require students to propose a critical thinking attitude, as evidenced by various questions that should be resolved. Caring for the environment is shown by giving suggestions that can be used to save pencils as a way to preserve the environment.

In Figure 19 some activities require students to execute activities to observe the process of making wood into tables and chairs, discuss with groups to share their answers. When students carry out these activities, it will automatically emerge curiosity. Students will carefully look at every process that wood undergoes to become tables and chairs. Based on the picture, students should answer questions, stimulating a critical thinking attitude. Students will analyze the question and then answer based on the existing data. In addition, discussions are carried out in groups to answer questions so that it will bring up a responsible attitude. Discussions will make students more open-minded to the ideas conveyed by their peers.

In Figure 20, there is an activity that asks students to reflect on what activities have been done with household waste. Students discuss with parents what can be done with that. Discussion with parents will bring up an open attitude to new ideas because they will accept things they are told regardless of a different opinion. When students

reflect on this, it will indirectly lead students in bringing up an introspection. Reflection will allow students to assess themselves, whether they have applied what they should or otherwise. This is in line with the opinion [22] that an introspective attitude refers to an effort to understand oneself, desires as well as difficulties and pleasures. In the picture, the activities raise critical thinking attitudes, students discuss with their parents what to do with household waste. Through critical thinking, students can solve the problems of science concepts they experience. Given the picture, some activities require students to explain the activities conducted to the teacher, so this activity will create a sense of responsible attitude. Students will be aware of their responsibilities and obligations to tell the results to the teacher.

Based on the results of the analysis of the nature of science as an attitude in the student book, there was no discipline and openness to new ideas. Applying a disciplined attitude will allow students always to carry out every task assigned to them. The activity book that shows discipline has not appeared because it cannot be ascertained in real life. While an open attitude to new ideas is a likelihood to display generosity [19]. Accept every idea/opinion conveyed to every student. In the activity book, there was no open attitude to new ideas, the available activities are only limited to making suggestions on a problem, however, it was not found in students' actions.

4. CONCLUSION

Based on the results of research on the Analysis of the Nature of Science in the Student Book Grade 4 Theme 4 "Various Jobs" Published by the Ministry of Education and Culture 2017 Revised Edition, it can be concluded that: (1) The level of content of the nature of science as a product was 41%, which was in the fairly good category, the existence of facts, concepts, principles have been raised, while laws and theories have not yet found. (2) The level of content of the nature of science as a process was 39%, which is in the fairly poor category, the existence of observation, hypotheses formulation, experiment planning, data interpretation, conclusion drawing, prediction, and communication has been raised. Meanwhile, variable control and application have not yet appeared. (3) The level of content of the nature of science as an attitude was 75%, which is in the good category, the existence of a scientific attitude is complete comprising honesty, responsibility, objectivity, cooperation, critical thinking, curiosity, introspection, awareness or care for the environment, openness attitude to new ideas, and discipline.

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