



# Analysis of Scientific Literacy Aspects in the Fifth Grade Student's Book Themed “Ecosystem”

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**Abstract.** This study aimed to describes the scope of scientific literacy aspects in the fifthgrade student's book themed “ecosystem.“ This studyused a content analysis design. The dataresources in this studywas the fifthgrade student's book, themed “ecosystem” by Ministry of Education and Culture, Republic of Indonesia. The authors used documentation for data collection technique. Aspects of scientific literacy in each sub-theme are obtained through analysis of every statement on each page that is identified as containing scientific material in each sub-theme. The data validity test used triangulation of resources. The results of the studyshowed that the aspects of scientific literacy contained in the book in the form as the science body is 38.5%, form as a way to investigate is 37.8%, and form as a way of thinking is 12.5%. The interaction of sciencetechnology and the community contained in the book are 11.1%, the analyzed ofaverage percentage from all aspects is 33.75%. Suggested for studentbook writers especially science, it is better to consider the balance of scientific literacy aspects. This studydescribed characteristics of scientific literacy in student's books in a systematic, objective, and communicative.

**Keywords:** Scientific literacy · Student's book · Analysis

## 1 Introduction

Scientific literacy is students ability, skill, and competence in using knowledge and understanding of scientific concepts and processes to identify and acquire new knowledge, explain scientific phenomena, and take the conclusions about nature based on natural changes through human activities [1]. Scientific literacy is also the main foundation in education as a forum for students to learn about science contextually and implement it in daily life. Content related to scientific literacy should be involved in all aspects of the students learning process in order to mastered the scientific literacy skills. Mastered the scientific literacy would make it easier to adapt for students in Indonesia of advances in science and technology in the future.

Program for International Student Assessment (PISA) showed that the current states of scientific literacy in Indonesia is still deficient. This is evidenced by the results of the 2018 PISA survey that showed of Indonesia in the category of reading, science, and math

skills is ranked 74th out of 79 countries. This is caused by the low ability of students and the lack of supporting facilities in the science learning process. As the result of low condition of scientific literacy ability of Indonesian students if not resolved soon, could impact the low quality of human resources and hinder the progress of science technology in Indonesia. Troubled by the case, the selection of used excellent and appropriate books used matched the specified standards could support efforts to improve scientific literacy for students. The position textbooks in the learning process are one of the learning resources that contain materials needed to achieve learning objectives, provided sources of knowledge for students and supported teachers in the learning process.

The results of the students' books showed more aspects of science as the body of science and as a way to investigate [2]. That most of the fifth-grade students of elementary school (SD) Sidorejo I Tuban, Indonesia tends still to have low scientific literacy skills for each indicator [3]. The inability of students in scientific literacy skills proved that students have not been able to scientifically solve problems in daily life and communicate the results of experiments carried out in writing. The importance effects importance the scientific aspect as the interaction of science, technology, and society is not balance from the analyzed that has been carried out by the author getting a total score of 39 and an average percentage of 27.08% [4]. That the development of scientific literacy needs to be done with a focus on preparing the next generation of scientific literacy through a culture-based curriculum to produce more contextual learning, especially learning resources used in the classroom learning process to improve the quality of education [5]. That the discovery of learning with ICT media for scientific and language literacy could improve student's skills more than conventional learning [6]. That based on the observations at the Muhammadiyah 2 Kupang elementary school, there were several problems found in science learning especially those related to scientific literacy which was still very low [7]. The problem caused of no students' participation to had play an active role in learning process, significantly in develop of scientific literacy process. The presence of the content nine in the thematic science in terms of knowledge element and the context of the books for grade sixth elementary school, and it could be concluded that the knowledge element showed a low percentage [8].

Based on the explanation above, it showed that scientific literacy is very low, and the analyzed of student books has not resulted a balance between the four existing scopes of scientific literacy aspects. These two aspects stand out: the scientific aspect as the body of science and the scientific aspect as a way to investigate. However, previous author has not shown study on scientific literacy in fifth-grade elementary school students' books on ecosystems themed. Thus, it is essential to research the analysis of student books to describe the scope of aspects of scientific literacy in the fifth-grade students' book, theme "ecosystem."

## 2 Method

This study used a qualitative approach with the content analysis design. Content analysis is a methodology that utilized procedures to draw valid conclusions from data based on context. The data source is the fifth-grade student's book, theme "Ecosystem" Karitas Puspita, Diana. 2017: Ministry of Education and Culture [9]. This data retrieval focuses

on each page identified as containing science (IPA) content. The authors used a documentation for data collection technique by identifying aspects of scientific literacy. Test the validity of the data used triangulation of data sources. The triangulation results were used to check data sets from various sources.

The instrument was used to collect the necessary data is an analysis sheet containing scientific literacy indicators adapted from the Chiappetta, Fillman & Sethna instrument in Padayache [10].

1. This study required data analysis techniques with several stages, namely:
2. Counted the statements for each scientific literacy indicator in each analyzed sub-theme.
3. Counted the number of statements for each aspect of scientific literacy in each sub-theme contained in the analyzed book
4. Calculated the percentage of aspects of scientific literacy indicators for each category in each sub-theme analyzed.
5. Calculated the average percentage of occurrences of scientific literacy indicators for each category in each sub-theme in the integrated thematic book.

### 3 Result and Discussion

Based on the analysis, the scientific literacy coverage score results are obtained, presented in Table 1.

The results indicated differences in emphasis on aspects of scientific literacy from the books analyzed through the guide sheet for analyzing aspects of scientific literacy. Continuously, each element of scientific literacy could be discussed in the studied book.

**Table 1.** Presentation of Scores of Scientific Literacy Aspects in each sub-theme

No	Indicator	Subtheme 1		Subtheme 2		Subtheme 3		Subtheme 4	
		F	%	F	%	F	%	F	%
1	Science as the body of science	29	56	12	23	11	21	52	38,5
2	Scienciasa way to investigate	18	35	17	33	16	31	51	37,8
3	Sciencias a way to think	3	18	7	41	7	41	17	12,5
4	Interaction science technology and Public	5	33	4	27	6	40	15	11,1
<b>Total</b>		<b>55</b>	<b>40,75</b>	<b>40</b>	<b>29,6</b>	<b>40</b>	<b>29,6</b>	<b>135</b>	<b>100</b>
Average 33,75%									

### 3.1 Science is the Body of Science

Science as the body of science could be said as a scientific concept that showed that science is a product. The percentage in the aspect of science as the body of science has the highest rate, which is 38.5% with details on sub-theme 1 with a score of 29 (56%), sub-theme 2 with a score of 12 (23%) and sub-theme 3 with a score of 12 (21%). That is, aspects of science as the body of science appear more often in books than other aspects of scientific literacy. In line with study of Utami and Desstyia [4] that in this aspect it has the highest average percentage level of the other three aspects of scientific literacy with a value of 79.16% and the total score of the sub-themes is 38. This also showed that the material in the fifth-grade student book by Ari Subekti for elementary school emphasizes material that is a science product.

Analogously with the study of Rahmawati and Istiningsih [2], the aspect of science as the body has the first percentage of 33% with details of sub-theme 1 at 31%, sub-theme 2 at 46% and sub-theme 3 at 23%. This showed that the aspect of scientific literacy as the body of natural science often appears compared to other elements. The high percentage of science aspects as the body of knowledge in this fifth-grade integrated thematic textbook is related to the science curriculum in Indonesia, as revealed by Firman in Aqil [11]. The existing books emphasize the content dimension more than the process and context dimensions, as PISA demands. Therefore, the selection of textbooks must be appropriately made so that students' scientific literacy skills increase. Selection of good readers is produced by analyzing books that involve aspects that contain scientific literacy, namely content, process and context.

Student books as the body of science must present, discuss and ask students to remember information, knowledge, facts, concepts, laws, theories and models [2]. The high percentage of scientific aspects of science as the body of science compared to other elements showed that science textbook writers focus on scientific knowledge such as scientific facts, concepts, and principles that students need to understand. Thus, there is minimal emphasis on students being more involved in the thinking process and the process of inquiry as well as their interaction with technology and society. Therefore, science must make it easier for students to understand textbooks and not only memorize material.

This, this fifth-grade student's book, emphasizes more aspects of science as the body of science than other aspects. It is proven that it asks students to present facts, concepts, and hypotheses and remember knowledge. If the book only emphasizes knowledge material, it could impact students' lack of motivation to learn science, affecting their interest in scientific literacy [4]. This illustrates that students could have less basis in studying science involving the scientific literacy level. Thus, the rapid development of science and technology with the abilities possessed by these students could not support it properly.

### 3.2 Science as a Way to Investigate

Based on the percentage of the aspect of science as a way to investigate, it has the second highest rate after the element of science as the body of science, which is 51 (37.8%) with details of sub-theme 1 with a score of 18 (35%), sub-theme 2 with a score of 17

(33%) and sub-theme 3 with a score of 16 (31%). In the aspect of science as a way to investigate, some indicators do not appear, namely teaching students through calculus and obtaining information from the internet, this indicates the calculus process in the formation of science as a process is not included in the learning material in the books being analyzed, and also students are not required to looking for information from the internet.

Based on data analysis, the most common indicator is teaching students through materials and data research who get the same score, namely 14 (27%). For example, indicators that guide students through materials are found in sub-themes 2 and 3 of the activity "Let's Read" which presents texts about food chains and changes in food webs. The reading text could provide learning through material so that students could identify and understand animal food chains.

The indicator requires students to explain the answer as one of the third indicators appearing in this aspect because many sub-themes emphasize this indicator. Rusilowati [12] states that it requires students to explain answers as an effort to train in interpreting and inferring ideas based on previously studied learning. The presentation of this indicator in the student's book aims to conclude ideas about the previously learned material, which are arranged in their own words. One example of this indicator is in sub-theme 1 of the activity "Let's Read," where the book presents reading texts for students to listen to. This activity asks students to read about ecosystem changes; then students could explain the causes and human actions that affect ecosystem changes.

Furthermore, the indicator of teaching students using tables and graphs has a total score of 7, and the percentage of conformity is 14%. The percentage level of agreement on this indicator is relatively low because in the book students use pictures more as a medium to provide examples to students. Another hand with a low value is using scientific observation and making conclusions with a total score of 4 and a percentage of conformity 8%. The last, lowest indicator is involving students to experiment by 1 with a rate of 2% because the hand only appears in sub-theme 3, involving students in the "Let's Try" activity where this activity involves students experimenting with making nets. Food.

Writing science books that act as a way to investigate is recommended to pay more attention to science as a process and present material that has criteria, namely, requiring students to answer questions through the use of tables and graphs, making calculations and gaining knowledge from the internet [2]. In writing, the nature of science as a process is recommended to be paid more attention because it is better to describe material that has the following criteria by Chiapetta et al. in Handini [13] namely: students are required to answer questions from the material, students are required to answer questions from the implementation of tables and graphs, students are required to do calculations, students are required to explain their answers and engage in experimental experiments.

Based on these various activities, it could be concluded that in the student's book on the science aspect as a way of investigating, more emphasis is placed on indicators of teaching students through the use of materials and data analysis, as well as explaining answers compared to other hands. This showed that, during the learning process, students should be directly involved so that students gain experience from the learning process.

### 3.3 Science as a Way of Thinking

Based on the percentage of the aspect of science as a way of thinking has a lower rate than the aspect of science as the body of science and the element of science as a way to investigate is 12.5% with details on sub-theme 1 with a score of 3 (18%) %, sub-theme 2 with a score of 7 (41%) and sub-theme 3 with a score of 7 (41%). This means that in writing the integrated thematic textbook the author has not paid attention to situations that invite students to think higher both in questions and in the content of the material. Whereas, as we know, the characteristics of science learning are experiments related to natural phenomena often encountered by students in daily life that require students to think more [13]. The application of learning that relates to daily phenomena could be used to measure students' scientific literacy.

The more dominant indicator appears in the student's book, providing a causal relationship with a total score of 7 and a percentage of conformity 41%. This indicator is found in all sub-themes of student books. In this book, students could learn more about science learning materials, especially ecosystems. This could be seen in "Let's read" explained in detail accompanied by a causal relationship. Through the text, it is expected that students could read the text, find information, and understand the factors that affect ecosystem change.

The second indicator in the student's book is discussing facts and evidence with a total score of 6 and a percentage of conformity 35%. Each sub-theme does not emphasize examining the facts and evidence shown in the student's book, where students are asked to discuss the problems that have been provided in the book at the end of each learning material. In the findings in sub-theme 2 in the "Let's practice" activity, students discuss with their friends to determine and make a food chain. In addition, in sub-theme 3 there is an activity "Let's Try" students work together with a group of friends to discuss the experiment of making food webs together. These activities train students to work together and discuss to exchange ideas and thoughts actively. Putra [14] explained that for students with the discussion method approach, learning is more emphasized on providing meaningful learning experiences by linking the ability to discuss to grow the ability to think, act, and have a positive attitude to improve learning achievement. This showed that, with the discussion, students could find their answers to a problem they are facing so that students could solve it and get a learning experience.

### 3.4 Interaction of Science Technology and Society

Science, technology and society are three inseparable components in which science underlies the development of technology and technology supports the development of science and the application of technology to support the needs of society for their lives. So, technological developments are always associated with society. Based on the percentage of the interaction aspect of science, technology and society, it has the lowest rate compared to other elements, which is 11.1% with details on sub-theme 1 with a score of 5 (33%), sub-theme 4 with a score of 4 (27%) and sub-theme 3 with a score of 6 (40%).

The indicator that appears the most is showing interaction with the Public or cooperation with peers obtained a score of 13 with a percentage of 87%. In the student book, several activities involve students discussing and collaborating with peers and parents at

home. This indicator is shown in subtheme 1. There are discussion activities with peers to establish cooperation between students in solving existing problems. This indicator is shown in sub-theme 1, where students discuss with a group of friends to make a table of animal names and types of food. In addition, in sub-theme 1, it was also found that collaboration between students and parents to make a card with A5 size; on the front surface of the card is attached a picture of an animal or a group of animals from one of the animal classes that have been studied, in line with Suprpto in Angelina & Rosdiana [15] that the use of learning media in the form of learning cards that could provide innovation in learning, could increase student motivation in education and be able to improve students' scientific literacy skills.

The second indicator showed the social and cultural impact, obtaining a score of 2 (13%). In this indicator in the student's book, it has demonstrated social and cultural effects; as an example after researching business in ecosystem maintenance, students could apply the material obtained in the surrounding environment, maintain ecosystems, and students could apply this activity indirectly and could apply the attitude of responsibility of students to protect the natural environment. In line with Rusdi et al. [16] Interest in science issues could encourage students to try to solve problems, especially those related to environmental problems so that students care and are responsible for the quality of the surrounding environment.

Showed the results that the importance of the scientific aspect as the interaction of science, technology and society is not balanced from the analysis that has been carried out by the author getting a total score of 39 and an average percentage of 27.08% [4]. From this it could be said that the aspect of science as the Interaction of Science, Technology and Society is the smallest percentage compared to other elements. By explaining this aspect of science as Science Interaction, Technology appears infrequently and is not included in student books. A good textbook could connect every material with scientific research, technology and society [2]. The selection of texts must still be adapted to existing conditions, especially the state of students. If the textbooks are chosen correctly, it is hoped that they could further improve understanding of science, which could improve scientific literacy. Therefore, another category is needed when analyzing books to provide students with a better science experience. The criteria set are according to Chiappetta, Fillman & Sethna [17]. Research the analysis and use of life sciences textbooks for the nature of science. The categories are science as a body of knowledge (Science as a body of knowledge), science as a way to investigate (Science as a way of Investigating), science as a way of thinking (Science as a way of thinking), and the interaction of science, technology. And society (Interaction of science, technology, and culture).

## 4 Conclusion

Previous study on the scientific literacy aspect has not shown a study on the scientific literacy aspect in the fifth-grade students' book theme "ecosystem". This study could help improve the balance of scientific literacy aspects. Based on the results of the analysis regarding the scope of scientific literacy in the fifth-grade students' book, theme "ecosystem" in general, the books analysed show more aspects of science as the body of

knowledge with a percentage of 38.5%, then aspects of science as a way to investigate with a rate of 37.8%, science as a way to think with a percentage of 12.5% and the interaction of science and technology and society with a share of 11.1%. The average rate of all aspects analyzed is 33.75%. This study has the limitation of only examining one book, so it is necessary to do a follow-up study on the analysis of scientific literacy in other student books. As for suggestions for writers of student books, especially science, it is better to consider the balance of aspects of scientific literacy.

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