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Exploration of Scientific Literacy in Indonesian Language Textbooks for Elementary and Secondary School

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Abstract: This study aims to explore scientific literacy in Indonesian language textbooks at the elementary and secondary school levels. The explorative qualitative method was applied in this study. The data was collected through explanation materials, procedural writings, scientific papers, exposition texts, and review texts from Indonesian language textbooks for elementary and middle school students. This study's data analysis technique was content analysis. The data was analyzed to confirm its suitability with the type of text represented and then validated for its role in supporting scientific literacy. The results of the research showed that (1) not all sample texts met the basic criteria as appropriate teaching materials; (2) if the text met the criteria as an example text of teaching materials, the text did not contain aspects of scientific literacy; and (3) of all the texts examined, only explanatory texts for elementary level students contained scientific literacy content in addition to meeting the criteria as sample texts of teaching materials. Based on these findings, Indonesian language textbook compilers should be more cautious in selecting samples of texts that will be discussed collaboratively by teachers and students.

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Introduction

The method has a special role as a determinant of success, both in research and learning, as well as in the social and scientific sectors. So far, the natural sciences (science) have methods that have been more thoroughly verified for precision but are frequently less successful in application. It contrasts with the social sciences, which are frequently successful in practice but need to properly explain the methodologies employed as the foundation for the study's success and learning (Rosenberg, 2020). This recognition of the method's significance ultimately provided a way for a scientific approach to social and science learning in Indonesia (Ghozali, 2017); (Wahyono et al., 2017); (Tambunan, 2019). For this reason, as stated by (Silva, 2012), science is a logical research process to solve problems and find answers to questions about natural phenomena. Scientists use scientific procedures to create a body of knowledge free of human views, perceptions, values, attitudes, and emotions. Such accomplishments are made possible by experimentally testing ideas and beliefs through open methods for public scrutiny. Scientific knowledge is not absolute or definitive. Instead, science tends to improve itself, developing more appropriate and convenient methodologies, techniques, and procedures.

Self-improving scientific traits, such as the statements above, are consistent with the thought of K-13 supporters, as stated in the introduction section of Indonesian seventh-grade textbooks, which instructs students to use textbooks as one of the bare minima of learning materials. Students are urged to seek out new learning resources that are more appropriate and provide a more pleasant learning environment (Zabadi, 2014). To provide a comfortable

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learning experience and remain aligned with the progress of the 21st century, the Ministry of Education and Culture of the Republic of Indonesia has made the scientific approach the basis for organizing defense on primary and secondary educatio (Peraturan Menteri Pendidikan Dan Kebudayaan Republik Indonesia, Nomor 103 Tahun 2014, 2014). The term approach to gender regulation is further explained by having relationships with strategies, models, and methods. It is understood by many researchers and practitioners in Indonesia, as by (Chuntala, 2019); (Kholifah, 2019); (Siti Nugraha & Suherdi, 2017) as attempts to gather information by observation, asking questions, doing experiments, performing data or information processing, presenting data or information, analyzing data, survey, conclude, and create.

Many understandings of the scientific stages demonstrate how researchers' attention has been centered on the learning process and statements about the process's success. Such as the research conducted on the effectiveness of the scientific method by (Afiyanti et al., 2022) (Prasasti, 2018); (Prasasti, 2016); (Setyowati & Mulyani, 2016). So far, a single article has yet to be found focusing on the criticism of the scientific load of the material prepared in textbooks or other books referred to as additional learning materials. As described by (Chakravartty, 2022) in the context of scientific literature, the public becomes the party that must also understand what science means as the basis for them to understand society, ultimately leading them to make the right decisions for the public. If related to student's interests, the success of K-13 as a curriculum established with a scientific approach, and specifically in the learning of the Indonesian language, also known as text-based learning, should not only be seen as the successful process of understanding the structure and aspects of the language of the text but students should also be allowed to know and even test whether the text they learn can be considered as science literacy (Laugksch, 2001); (Stfaova et al., 2010). As part of an informed society, students must eventually gain knowledge that will be helpful to them. As a result, it is deemed critical to undertake research studies focusing on investigating learning materials. This study aims to investigate the amount of scientific literature on Indonesian language textbooks at the primary and secondary school levels.

Research Method

The method used in this study was qualitative. The data collected related to information from explanatory texts, procedural text, scientific work, exposure text, and review text from Indonesian language textbooks for primary and secondary school students. Aspects of scientific literacy linked with the usage of words, phrases, and sentences are examined (Arum & Winarti, 2019). Data were analyzed using content analysis techniques. The data sources used were Indonesian language textbooks for seventh-grade students for text study at the basic level and eleventh-grade for text studies at the middle level. In both textbooks, the exploration of scientific literature was reviewed from the general scientific load contained in the example text.

Results and Discussion

This study seeks to prepare the way for a more thorough examination of the scientific content of Indonesian textbooks. Suppose all of this scientific knowledge has been proven beneficial in studying various materials. Does the text content employed during learning succeed in building the scientific knowledge students require as members of a growing society? As a result, this research focuses on the development of Indonesian textbooks, the coverage of scientific literature, scientific terminology in explanatory texts, and scientific

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literacy in the texts of Indonesia Language Textbooks for primary and secondary school students.

Scientific Literature in Indonesian Language Textbooks

Indonesian language textbooks for students in the eighth-grade edition (Kosasih, 2020) contain news materials, advertisements, exhibition texts, poetry, explanatory text, review text, persuasive text, drama, and reading. Exposure texts, explanation texts, and review texts are three of the nine materials mentioned above that could be converted into materials to promote primary school students' scientific literacy. Kosasih (2020) states that the exhibition text comprises two major components: thoughts and facts. The explanatory text explains the relationship between events and the process of occurrence of something; the description can be causal or chronological. The textual structure of the explanation begins with introducing phenomena, a series of events, to reviews. The text of the review itself is a commentary or an assessment of the consequences of previously displayed events. The comments can be good words, pleasant, and exciting.

Indonesian language textbooks for students of eleventh-grade edition revision (Suherli et al., 2017) contain procedural text materials, explanatory texts, lectures, short stories, proposals, scientific works, reviews, and dramas. Procedural text materials, explanatory texts, lectures, proposals, scientific works, and reviews are among the eight areas that may embody scientific literacy. The aim of procedure text is to explain how to write the stages of an activity with a general statement. The equalization text aims to study how to tell the procedure or process of the occurrence of events. Moreover, the aim of the lecture text is to learn how to impart mastered knowledge after discovering actual information and difficulties. The information read is used to prepare the proposal. Scientific work is used as a teaching tool to teach students how to pay attention to facts, purpose, and the substance of scientific work. Reviews lead to writing about whether a novel is good or bad.

Along with the knowledge that science literacy taught in schools often does not touch on knowledge of modern science such as genetic modification, climate change, and fake intelligence, but rather knowledge that is broadly understood by society and is capable of building curiosity (Chakravartty, 2022); (Vlahakis et al., 2014). Knowledge of the phenomena they read can be used to make the right decision. There are three scopes of science literacy proposed by (Winata, Anggun dan Cacik sri, 2016) namely (1) identifying scientific issues, such as valid scientific opinions or theories that are proven to support hypotheses; (2) explaining scientific phenomena, such as evaluating the validity of sources, understanding the design elements of research, making graphs from data, solving problems with quantitative skills of both averages, probability, frequency, and percentage, understanding and interpreting basic statistics such as interpreting mistakes and needs based on a statistical basis; (3) using scientific evidence by doing inference, prediction and drawing conclusions based on quantitative data.

Therefore, the texts investigated for the explanation of science literacy in English textbooks for elementary and secondary school students are (1) explanatory texts that may attract readers' interest due to their substance regarding phenomena (universal/social) via causality or chronological descriptions; (2) procedural texts, because their content is a stage in doing something in general, can raise curiosity; (3) scientific works provide material that may contain prose that piques the reader's interest due to the knowledge provided therein; (4) review text can also raise general knowledge because its content is related to values and consequences of events that have been previously displayed; (5) exposure text can invite curiosity since its contents are ideas and facts. Thus, the study will explore five texts, each of three types of text at the primary school level and two types of texts at the high school level.

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Scientific Literacy in Explanatory Texts

The explanatory text according to Barwick (Nasrillah et al., 2019); (Dewi et al., 2021) is a text that contains the process and reason why something happens in this world. Explanation texts that are examples for students in eighth grade can be found on page 128 of the new edition of the Indonesian Language Textbook (Kosasih, 2020). The text is a scraping of text with no title. Only the first part was shown. The document is an explanation text since it outlines the method and reasons for determining Bandung Regency's anniversary. // The government of Bandung Regency began with the Charter of Sultan Agung Mataram on April 20th, 1641. This date was later designated as the anniversary of the Bandung Regency. //Several pieces of evidence were presented, starting from the charter of Sultan Agung Mataram, developed during the Pajajaran Kingdom, to the era of the transfer of his mother the city of Bandung from Krapyak to the banks of the Cikapundung River during the Deandles era //... (1794-1829) The capital city of Bandung Regency was moved from Krapyak (Dayeuhkolot) to the banks of the Cikapundung River or Bandung Square today...// This text undoubtedly triggers students' curiosity regarding the origins of one of Indonesia's most famous towns. The inclusion of sequential historical records replete with periods and date data validates the text as one of the scientific literacy found in Indonesian language elementary textbooks.

There is an explanation text that serves as an example at the secondary school level which can be found on page 48 of the eleventh-grade Indonesian language textbook. The text is entitled “Mass Demonstrations” (Suherli et al., 2017). At the beginning of the text, demonstrations are considered as a phenomenon. //Recently, demonstrations often occur almost every time and occur in various places. Demonstrations have become a common phenomenon in our society….// In the next section there is a discussion about whether or not demonstrations are necessary in terms of the truth of the reasoning //…the demonstrations they usually do are purely to fight for truth and against evil…//In the middle of the text is a statement containing facts //…Many facts can prove it. The mass demonstrations during the early reforms in this country in 1997–1998 were not carried out by the poor or hungry people….// If we look closely at the procedure and the reasons for the demonstrations, we can see that component did exist. It's only that popular understanding of demonstrations should be reinforced with information from historical records about where and when demonstrations first began in the world as massive movements to express public opinion. This sample text does not provide enough theory to support the hypothesis, hence it is more suitable to refer to it as a review text. The topics discussed seem to have more potential as review texts (Yetti, 2018) considering that demonstrations are indeed a phenomenon among the people, but given the risks that can sometimes harm demonstrators in disbanding demonstrations, this kind of text is more appropriate as an example of a review text whose contents can show the positive and negative consequences of demonstrations.

Scientific Literacy on Procedure Text

Technically it is explained by (Suherli et al., 2017) that the procedure text contains general statements and the stages of doing a task. The intended stages are described including exposure, directions, and instructions for doing something according to sequential steps (Ayunisyah & Arifin, 2020); (Isodarus, 2017). Procedure texts are taught at the secondary level. As a result, the examples of process texts discussed are solely from eleventh-grade textbooks, specifically on page nine. The procedural text used as an example on page nine is entitled "How to turn on a computer". Judging from its contents, the text contains a general statement //Computer is an electronic device...//Then there is a section showing the stages of doing // (1) Open the cover of the computer, CPU, keyboard, and printer layers; (2) Make

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sure the switch is connected to the electric current…; (3) Press the power button on the CPU and monitor power button; (4) the computer will boot…; (5) …computer will be ready for use//. From the "How to Turn on the Computer" segment, apart from general statements and sequential steps, there are also aspects of directions and instructions. Thus the text is indeed procedural. However, the text contains only some important aspects of scientific literacy. For a teaching material prepared in 2017, the contents of the text do not captivate the curiosity of its readers as they should be found in a text categorized as scientific literacy (Chakravartty, 2022). The students who study the text are already in an era that provides AIO (All in One) computer devices. One-time press power can turn on the CPU and layer at the same time. Not to mention that the average student already has a cell phone that has software with computer-like functions.

Scientific Literacy in Scientific Texts

Scientific work is a text that is rich with information, either in the form of theory, methods, or research results. As described by (Suherli et al., 2017), scientific work is a set of information, data, explanations, and thoughts in a clear, concise, and straightforward manner. This text is only taught at the high school level. In Indonesian language textbooks for ninth grade, sample texts for scientific work can be found on page 183. The text is in the form of excerpts of reading with no title. After the "Introduction" section, it is followed by writing the "Background to the Problem" section which contains information about classical literature. In the third paragraph, there is a quote from Shariati complete with the year written in brackets. At the end of the Background section, it is written //…Therefore, the author believes that a deeper study of this issue is very important.// There are two common mistakes in the last statement, namely the language of scientific papers which is usually conveyed passively. (Suyatno et al., 2020), in this statement it is stated actively by stating//…the author is of the opinion…//. The second mistake was made by stating //…a deeper study of this problem is very important.//. It seems as if the scientific papers that are being compiled are more adequately used as a source of information about classical literature compared to other previous writings. A theoretical quote in the sample text on page 183 indicates the shallowness of the theoretical study and how in-depth the study efforts are regarding classical literature.

In the third paragraph "Focus and Theoretical Framework," there is a statement //the research above requires support from literary theories, moral theory, and anthropological theory...// but there is no commentary on the theories that have been mentioned. The absence of a review of the three theories is understandable because the only theory in this section regards the domination of Malay classical literature in the archipelago. The scientific work text in the example above clearly does not contain anything that makes it worthy of being categorized as having scientific literacy content. After all, the theory is a set of propositions used to explain some phenomena and narratives and even influence the methodology, which will later show research procedures (Tennis, 2008). There is no theoretical review of the structure of Malay classical literature, but it does appear in the “Research Objectives” section, namely //Describing the structure of Islamic Malay literature…// then the next two questions are related to the moral categories and characteristics contained in Classical Malay literature.

Scientific Literacy on Expository Texts

The exposition text becomes material in the eighth grade of the Indonesian language book, which is on page 59 with the topic "Exposition Text in Mass Media." According to Kosasih (2020), the text of the exposition contains certain assessments, encouragement, and invitations to the audience. An example of an expository text can be found on pages 60-61

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with the title "The Fate of Our Forests is Getting Gloomy". The section containing the assessment can be found in the first paragraph //…The loss of Sumatra's forests will be followed by the loss of Kalimantan's forests.// Also in the second paragraph // Forest management shows no signs of improvement compared to the previous year…//. In the third paragraph, all sentences contain a judgment. Likewise with the fourth paragraph and so on. The part that contains encouragement can only be found in the first paragraph // If the government does not act quickly in the next ten years, Sumatra's forests will be destroyed.//

There are no invitation-containing sentences in the sample text. It is surprising because "invitation" is an aspect deemed crucial by textbook compilers in the design of informative materials. Such an important aspect of this invitation is that in the concept presented by Rosmayanti (2022) it is explained that an exposition text is a text that contains personal ideas or suggestions, so this text is also known as a one-sided argumentation text. This aspect of the call is important. The text used as an example on pages 60-61 did not contain any composition of information containing a call to stop forest destruction in the Sumatran region.

Even though it did not meet the criteria as an expository text, the example text on pages 60-61 contains content that fulfills the requirements as a text that contains scientific literacy. For example, in the text, there are scientific issues, such as in paragraph one, regarding the destruction of Sumatran forests, which can trigger the destruction of other forests adjacent to the region. Also, several valid information in paragraphs ten and eleven because the information submitted is supported by explaining the date and details of the percentage of forest fires found.

Scientific Literacy in Review Texts

Examples of review texts can be found in Indonesian language textbooks for elementary-level students. A review text can generate general knowledge because its content is related to the values and consequences of the events that have been previously described. (Kosasih, 2020). In the example text on pages 156-157, the third paragraph of a review of the film *Laskar Pelangi* contains values about the appropriateness and inaccuracy of the actor's choices. //The important decision by director Riri Reza and producer Mira Lesmana to choose Belitong's tnative children turned out to be the right one. They can complete their respective characters even though they don't have previous acting experience…Riri and Mira are famous for their ability to launch new talents…//. In the next paragraph, there is a part that shows the consequences of choosing native Belitong children, //Zulfani and Ferdian show an extraordinary appearance as new people in the world of acting…their innocence feels very natural…//.

The text that has demonstrated its correctness as a solid example of the sort of review text does not contain enough scientific components. Its duty as scientific literacy can be fulfilled if it is stated in the text, particularly in the many sections that discuss judgments, which film character made the assessment. Alternatively, data exposure from box office sources or something similar might be offered in an assessment of all films that are reported to be of high quality. The discrepancies between the novel and the film storyline are discussed in the final paragraph. //The scenario is slightly different from the story in the novel with the addition of several teacher characters that Andrea didn't write about…//. To qualify as a scientific description, this statement must be supported, for example, by clarifying the list of professors who were added, what their names were in the film, and who played them. However, source validation needs to be done to show that all the information conveyed in the text is true and can be further verified (Winata, Anggun & Cacik sri, 2016).

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The conceptual implication of the findings above is that book authors must include scientific content in texts provided as Indonesian language teaching materials. The practical implications are (1) each book author is required to use more than one source/opinion when explaining knowledge related to linguistic structures and tools because the synthesis of the two opinions is a form of application of scientific principles (Novianti Samin & Mukhtar, 2016) ; (2) to support the integration of the scientific spirit in scientific-based Indonesian learning, texts that are used as teaching materials should contain knowledge of language, culture, daily experiences, and the use of mass media related to scientific activities (Donatirin & Hananta, 2017).

Conclusion

Investigating scientific literacy in Indonesian language textbooks at the primary and secondary levels yielded some significant results. Not all sample texts met the basic criteria for teaching materials because they did not correspond to the structure and linguistic aspects of the text that should be taught, such as explanatory texts for eleventh-grade students, scientific work texts for middle-level students, and exposition texts for elementary-level students. Second, if the text met the criteria as an example text, it did not contain aspects of scientific literacy, which ideally exists considering that the curriculum for teaching it is scientifically based. Then science includes the learning method and teaching materials, such as procedure texts for middle and high school students and reviews texts for elementary-level students. Third, of all the texts explored, only explanatory texts for elementary-level students, besides meeting the criteria as sample texts, also contain scientific literacy content.

Recommendation

For the authors who compose Indonesian language textbooks, the text chosen as an example should be reviewed more carefully, starting from the aspects of the accuracy of the structure, and the language tools, to the content of scientific literacy. Considering that the current curriculum is scientifically based, Indonesian language teachers in primary and secondary schools are only appropriate if the material being taught still needs to contain scientific literacy content, independently trying to enrich students' learning experience by directing them to find scientific literacy during learning.

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