Development of Science Literacy-Based Children's Science Books Integrated Local Potential of Madura

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Abstract

Children's story books have an important role in the world of education, especially at the elementary school level. However, the availability of story books that support learning is still very limited. Therefore it is important to develop children's story books that can be used as a companion to textbooks and to train literacy from an early age. This study aims to develop children's science story books based on integrated scientific literacy in Madura local potential that are feasible in terms of validity, effectiveness, and attractiveness. This development research uses procedures 4-D models (four D models). The results showed that the development of children's science story books in terms of the validity aspect obtained an average percentage of 89% in the valid category, the effectiveness aspect obtained a classical completeness percentage of 93% in the effective category, and the attractiveness aspect obtained an average percentage of 100% in the attractive category. Based on the research data it can be concluded that the development of scientific literacy-based children's science story books that are integrated with the local potential of Madura is deemed feasible to use.

Keywords – Science Storybook; Science Literacy; Madura; Local Potential.

1. Introduction

Facing the challenges of the increasingly rapid industrial revolution, the world of education, especially the primary and secondary education levels, is required to immediately improve. The Industrial Revolution 4.0 has demanded the world of Indonesian education to implement 21st century learning by integrating learning skills and literacy. Learning skills are learning activities in which they are characterized by cooperation, communication, and critical and creative thinking while literacy is a person's ability to process and understand information when carrying out the process of reading and writing (literacy/illiteracy eradication movement) . However, in its development, the current definition of literacy has evolved according to the challenges of the times. The new definition of literacy shows a new paradigm in trying to interpret literacy and its learning such as media literacy, computer literacy, science literacy, school literacy, and so on. Likewise in learning science in elementary schools which requires students to be literate in science or what is known as scientific literacy.

Scientific literacy is a person's ability to use scientific knowledge to identify problems and draw conclusions based on evidence in order to understand and make decisions about nature and changes made to nature through human activities. Scientific literacy is important for students to master in relation to how, students can understand the environment, health, economy, and other problems faced by modern society which is very dependent on technology and the progress and development of science. Individuals who are scientifically literate will be able to solve problems in everyday life and produce useful scientific products.

Scientific literacy is defined in PISA as one's scientific knowledge and the use of that knowledge to identify questions, acquire new knowledge, explain scientific phenomena, and draw evidence-based conclusions about issues related to science, understanding of the characteristic features of science as a form of knowledge and human inquiry, awareness of how science and technology shape the material, intellectual, and cultural environment, and a willingness to engage in issues related to science, and to problems of science, as reflective citizens

(OECD, 2006) . Toharudin (2011) emphasized that scientific literacy is the ability to understand, communicate and apply science in solving problems so that they have good sensitivity to the world around them and make decisions based on scientific considerations. Meanwhile, according to Turiman et al., (2011) states that scientific literacy ability means the ability to understand scientific concepts and their processes needed to make decisions about what happens in society.

Currently, the ability of scientific literacy in Indonesia, especially on Madura Island, is still relatively low. Based on the results of research by Qadarusman (2018) it shows that the ability of scientific literacy in the competency domain of grade 5 students at SD Kepulauan Mandangin, Sampang Regency in the aspect of explaining scientific phenomena obtains a scientific literacy competency level of 33.03%. These results indicate that students' literacy competence is still low, so efforts are needed to improve and develop scientific literacy in the area. This really needs to be done as an effort to improve the quality of human resources in facing the 21st century. In addition, one of the factors directly related to student learning activities and influencing the low scientific literacy ability of Indonesian students is the existence of learning resources in the form of books which have so far been the main source of student learning in schools.

According to Kurnia, et al (2014: 43) the low ability of Indonesian students' scientific literacy is influenced by many things, including the curriculum and education system, the selection of teaching methods and models by teachers, learning facilities and facilities, learning resources, teaching materials and so on. Selection of textbooks which contain a good scope of scientific literacy aspects is a simple first step that teachers can take to build students' scientific literacy in elementary schools, so it is important for a teacher to understand the scope of scientific literacy aspects of the textbooks used. The results of Mardiyana's research (2018) on the analysis of grade 5 science textbooks in terms of scientific literacy aspects show that the scope of the scientific literacy aspects of the books analyzed is especially in the field of biology, namely 67.4% contain aspects of

scientific knowledge, 16.8% contain aspects of scientific inquiry, 13.3% contain aspects of science as a way of thinking, and 2.5% contain aspects of the interaction of science, technology and society. These results indicate that the books used do not show a balance of aspects of scientific literacy where the aspect of scientific knowledge is still far greater than the other three aspects.

Elementary school-age children generally prefer to read books that contain stories. Children seem not to realize that they are learning when reading story books (Setiawati, Rusilowati, & Khumaedi, 2013). Storybooks are basically one of the reading text books made for the learning process. The presence of story books is something that is common and is very liked by children. It is also used as a learning resource. Interesting as a source of learning, because stories can be visualized with attractive pictures and colors according to the plot and setting of the story. Thus, children can understand and relate it to their personal experiences, stimulate imagination, gain pleasure and exist in society.

In addition to scientific literacy, the application of 21st century learning must also be meaningful and be able to maintain the preservation of local culture. To maintain the preservation of local culture, in the implementation of education it is necessary to integrate local cultural wisdom with the aim of forming children's character according to their ancestral identity and identity. Studying the conditions of the surrounding natural environment such as the natural and cultural potential of the local area can increase a sense of love for the homeland, especially for the land of birth.

Madura Island consists of four districts that are rich in local potential, both natural and cultural, including Bangkalan Regency. Bangkalan Regency has very diverse potential, both natural potential and cultural potential. The natural potential of Bangkalan district can be developed to support human needs, such as the existence of tourism sites and work areas. While the cultural potential that exists in Bangkalan district such as the existence of traditional ceremonies, the tradition of karapan sapi and so on (Dinas Culture and Tourism of Bangkalan , 2019) . One way that can be done is to include stories about the various natural

and cultural potentials that exist in Bangkalan district in the science learning process in elementary schools.

Based on the description above, it shows how important the companion textbook is which contains the scope of aspects of scientific literacy to build students' scientific literacy in elementary schools . Therefore, the researcher aims to develop a companion textbook that contains a collection of science stories.

2. Method

This research is a type of development research. The product of development is in the form of children's science story books for elementary school students based on scientific literacy integrated with the natural and cultural potential of Madura. This development research model refers to the 4-D model (four D model) developed by Thiagarajan, Semmel & Semmel (1974:5). The use of this model is based on the consideration that this model is developed procedurally in accordance with systematic steps. The development consists of four stages, namely the define , design , develop , and disseminate stages .

subjects included expert test subjects and field trials. Subjects for this expert test were material experts (science and Madurese potential), linguists, and teaching material design experts. Field trial subjects included 9 students in small group trials and 30 students from class IV and V MI Al Mu'tadil Klampis Bangkalan . The sampling technique was purposive sampling.

Data collection instruments for the development of children's science story books based on scientific literacy integrated with the natural and cultural potential of Madura are shown in Table 1 below.

Table 1. Data Collection Instruments

Aspect	Instrument	Observed Data	Respondents
validity	Validation Questionnaire	The validity of science story books	Design experts, materials experts, linguists
effectiveness	Test	Scientific Readability and Literacy	Trial Subjects
attractiveness	Questionnaire	Student Response	Trial Subjects

Data analysis used in this research is descriptive qualitative and quantitative descriptive analysis. Qualitative descriptive data analysis is used to process data in the form of notes, suggestions, or comments based on the results of the assessment contained in the validation questionnaire, and the attractiveness questionnaire. Meanwhile, quantitative descriptive analysis was used to analyze data in the form of scores from validation results, student response questionnaires, and scientific literacy tests. Analysis of the validity of children's science story books based on integrated scientific literacy of Madura's natural and cultural potential can be seen from the validation results of material experts (concepts of science and Madurese potential), design experts, and linguists. Children's science story books are declared valid if the percentage of expert validation questionnaires has a validity percentage of ≥ 80%. Analysis of the effectiveness of science literacy-based children's story books integrated with the potential of Madura's nature and culture measures how far the level of effectiveness of storybooks based on integrated science literacy with the potential of Madura's nature and culture is tested in class. Indicators of the effectiveness of children's science story books were analyzed using data on readability tests and students' scientific literacy tests . The average score obtained by each student after completing the test is ≥ 70. Storybooks are said to be effective in classical completeness, reaching 85% of all students scoring ≥ 70. Analysis of attractiveness science literacy-based children's story books integrated with the natural and cultural potential of Madura can be seen from the results of the student response questionnaire asked at the end of the trial implementation of (a) the attractiveness of the content (content) of the story (b) the

attractiveness of the illustrations in the storybook, (c) the language used. Children's science story books are declared interesting if the percentage of student response questionnaires has an attractiveness percentage of ≥ 80%.

3. Result and Discussion

The results of this development research are scientific story books based on scientific literacy integrated with the potential of Madura's nature and culture. The story book being developed is titled Ini Maduraku: Collection of Science Stories Based on Madura Potential. Based on the initial stages of the research, the results of the needs analysis were obtained as follows.

a) Scientific literacy has not been fully mastered by students. This is because science learning has not fully demonstrated the nature of science, making it difficult to associate scientific knowledge with the phenomena that occur
b) Based on the results of the analysis of aspects of scientific literacy in the thematic books for grade 5 elementary school students in the 2013 curriculum published by the Ministry of Education and Culture in 2017, the following data were obtained.

Table 2. Analysis of Scientific Literacy in Class 5 Student Theme Books

SCIENCE LITERACY ASPECT	ANALYSIS RESULTS
Aspects of Science Concept	Science concepts are presented quite well in student textbooks. Overall, the material or science concepts presented in each theme have relevance to everyday life, contain important scientific concepts, and are in accordance with the characteristics of grade 5 students. Indicators of science concepts that have not been included or are still not presented in student books are questions, reasoning, and scientific statements.
Process Aspects of Science	The science process has the lowest coverage compared to other aspects of scientific literacy. Not all indicators of the science process are included in the student book. The science process aspect indicators that appear in the book only identify scientific phenomena and analyze and apply scientific knowledge. Student books do not yet contain indicators of aspects of other scientific processes such as

	identifying and evaluating scientific questions, interpreting data and evidence, differentiating arguments, and drawing conclusions.
Science Context Aspects	The science context is presented quite well. Overall, the themes in the student book contain scientific phenomena that are closely related to everyday life. Some of the themes contain the application of science in other fields such as health, environment, technology, and utilization of natural resources. Based on the results of the analysis, it is known that the scope of the science context in each theme is closely related to the topic of the theme's material.

a class 5 science content material mapping was carried out which could be integrated with aspects of scientific literacy and local Madura potential. The mapping results are presented in Table 3 below.

Table 3. Integration of Scientific Literacy Aspects of Class 5 Science Content

Theme	Local Potential		Aspects of Scientific Literacy
	Natural Potential	Cultural Potential	
1. Animal and Human Movement Organs	-	Cow Race	Movement in Animals
2. Clean Air for Health	Gili Iyang Island	-	Respiratory system
5. Ecosystem	Labuhan Beach	-	Ecosystem
8. The Environment of Our Friends	Pocong Water Source	-	Water cycle

Based on table 3 above, four themes in class 5 natural science content can be integrated with the local potential of Madura. The four themes were developed into children's science story books based on scientific literacy. The science story book contains four stories covering the local potential of Madura. The four stories are entitled *“ Kile Karapan Sapi ”*, *“ Gili Iyang Island ”*, *“ Labuhan Mangrove Educational Park ”*, *“ Source of Pocong Bangkalan ”*.

Books are validated by experts to get an assessment of the validity of the books being developed. The results of story book validation were obtained from

material experts, linguists, and design experts. Based on the validation questionnaire, the results are presented in Figure 1 below.

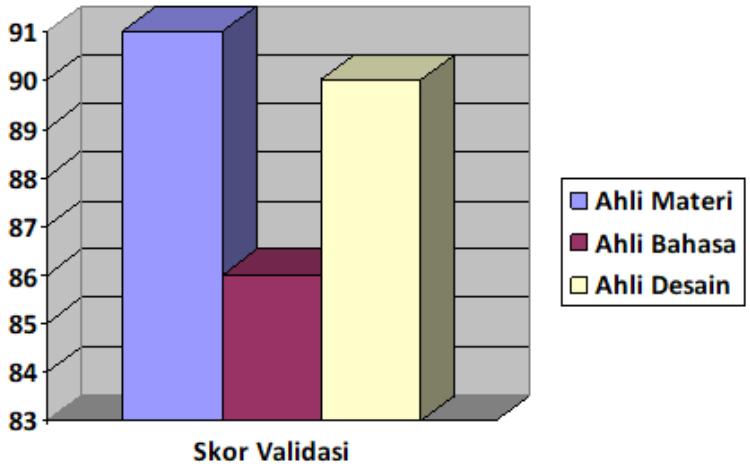

Figure 1. Results of Science Storybook Validation Scores

Based on Figure 1, an average percentage of the validity of children's science story books is 89%. Based on the validity criteria of children's science story books, the book is declared valid. After the science story book was declared valid, small group trials and large group trials were carried out on students in grades 4 and 5 of MI Al-Mu'tadil, Klampis District, Bangkalan Regency.

To find out the effectiveness of children's science story books, readability tests were carried out at the small group trial stage and scientific literacy tests at the large group trial stage. The results of the book readability test are presented in table 4.

Table 4 . Small Group Test Readability Test Results

Instrument	Number of test subjects (students)	Number of students completed	The number of students is not complete
Readability Test	9	9	-

Based on table 4 data, it is obtained that the classical completeness for the readability test is 100%. Thus science story books can be declared effective so that they can be continued to the large group trial stage.

Large group trials were carried out by giving scientific literacy tests to a larger number of subjects. The results of the scientific literacy test are presented in Table 5. Based on the data in table 5, namely the large group trial stage, it was obtained that the classical completeness for the scientific literacy test was 93%. Thus children's science story books can be declared effective so that they are suitable for use.

Table 5 . Results of the Large Group Trial Phase Scientific Literacy Test

Instrument	Number of test subjects (students)	Number of students completed	The number of students is not complete
Science Literacy Test	30	27	3

In addition to testing the validity and effectiveness, an attractiveness test was also carried out to determine the feasibility of story books. To find out the attractiveness of children's science story books, a response questionnaire was distributed to the experimental subjects at the small group trial stage and the large group trial stage. The following data from the results of the student response questionnaire are shown in Table 6.

Table 6 . Student Response Questionnaire Results

Trial Stage	Number of test subjects (students)	Total Score Acquisition	Maximum Total Score	Average Percentage of Student Response Questionnaire Scores
Small Group Trial	9	90	90	100 %
Large Group Trial	30	300	300	100 %

Based on Table 6, the average percentage of student response questionnaires in the small group trial was 100% and the average percentage of student response questionnaires in the large group trial was 100%. Based on this percentage, children's science story books are declared interesting so they are suitable for use. The science story books that have been produced in this study are presented in the following figure.

Figure 2. Front Cover of a Storybook

Figure 3. Table of Contents

Figure 4. Introduction to Story Characters

Figure 5. Story Description

Figure 6. Cover of the Cow Race Story Section

Figure 7. Cover of the Story of Gili Iyang Island

Figure 8. Cover of the Story Section of the Labuhan Mangrove Educational Park

Figure 9. Cover of the Pocong Sumber Springs Story

Figure 10. Author Profile

Figure 11. Back Cover

Story books are one of the effective teaching materials in children's education. In addition to developing reading skills and imagination, story books can also be used to introduce science concepts in a fun way. The use of children's science story books as teaching materials to support learning provides many benefits. Based on the results of the study, it was found that the use of children's science story books that were integrated with the local potential of the region could increase scientific literacy. Children's science story books are designed with an attractive narrative style and colorful displays and illustrations. This can arouse children's interest in science and make them more interested in learning complex science topics.

4. Conclusion

The results showed that the feasibility of developing children's science story books based on scientific literacy integrated with Madura's natural and cultural potential was declared valid based on an expert validation questionnaire with an average percentage of 89%, declared effective based on student scientific literacy tests with a classical completeness percentage of 93%, and declared attractive based on the results of student response questionnaires with an average student response percentage of 100%. Based on the criteria of validity, effectiveness, attractiveness above, the development of children's science story books based on scientific literacy integrated with the potential of Madura's nature and culture is declared suitable for use.

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