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Developing Digital Storybooks to Enhance Primary School Students' Scientific Literacy: A Needs Analysis

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ABSTRACT

Science literacy skills in Indonesia are still relatively low. This study aims to analyze the need to develop learning media, especially digital storybooks, to improve the science literacy of fourth-grade elementary school students. The analysis involves literature studies, field studies with teacher interviews, and evaluating learners' science literacy abilities. The results of the analysis showed variations in learners' learning styles (visual, auditory, kinesthetic) and low science literacy needs. The teacher stated that the independent curriculum is used with learning activities that have applied science literacy, but it is still limited. The science literacy ability of students was recorded to be low, with an average percentage of 43.53%. Teachers see the need for innovation through digital learning media, especially picture storybooks, to increase students' interest and understanding of science material. Based on these findings, the development of digital storybooks can be an effective solution to improve the science literacy of fourth-grade students. It is hoped that implementing this media will help strengthen science literacy skills and improve the understanding of scientific concepts in everyday life. This research contributes to the field by providing evidence-based recommendations for integrating digital storybooks into the curriculum, thereby enhancing the effectiveness of science education in primary schools.

Keywords: *Digital Storybook, Needs Analysis, Scientific Literacy*

INTRODUCTION

21st-century education is an education system that integrates knowledge skills, skills, and attitudes as well as mastery of ICT. To prepare these skills, strong literacy is needed for students starting early. Literacy is the ability to read, write, and individual skills in processing information (Banila et al., 2021; Irsan, 2021). Therefore, literacy can help learners in developing reading skills and relate them to the subject matter. In the 21st century, science learning is learner-centered learning, and learning can be developed by learning science literacy (Pertiwi et al., 2018). A person's scientific literacy ability can help in shaping the mindset, and behavior, and building human character to care and also be responsible for himself, society, and the environment, as well as the problems faced by modern society which is very dependent on technology (Achmad et al., 2022; Snow, 2016). Science literacy in elementary schools aims to give students the ability in terms of knowledge and also understanding of scientific concepts to participate in the community environment so that

students can identify problems that exist in science learning in their daily lives (Prasetyo & Mahmud, 2020). Aspects of science literacy skills in students at the elementary school level are being able to be interested in science, appreciate scientific approaches, environmental awareness, and be able to explain natural phenomena (Wibowo, 2021).

In 1997, the OECD (The Organization for Economic Cooperation and Development) initiated a program called PISA (Programme for International Student Assessment), this program was created as a manifestation of the importance of science skills in life. The results of research conducted by PISA in 2018 show that the level of reading, mathematics, and science scores in Indonesia is still relatively low because it is below the average OECD score (OECD, 2019). Indonesia ranked 72nd out of 79 countries that took the test. PISA results show that the average score of Indonesian science only reaches a score of 396 which means it is below the OECD average of 489. In addition to PISA, the Trend in International Mathematics and Science Study (TIMSS) also conducts measurements on science literacy which are carried out every four years. This survey aims to compare the Mathematics and Science achievement of grade 4 and 8 learners in several countries. Based on the results of TIMSS data in 2015, Indonesian science literacy was ranked 44 out of 49 participants with a score of 397 while the international average score was 500 Guhn et al., (2015). The results of the survey conducted by PISA and TIMSS show that the achievement of science and science literacy skills of Indonesian children is still relatively weak. Therefore, based on the results of PISA and TIMSS show the importance of applying science literacy in 21st-century learning in Indonesian education.

The low ability of science literacy is generally caused by learning activities not directed at the development of science literacy (Nisa et al., 2021). The ability to read comprehension has a relationship or correlation with science literacy skills because reading can involve a mindset that can build a conceptual understanding and can support investigation and a culture of scientific thinking (Ayu et al., 2018). In addition, the demand for the completion of teaching materials within a certain time according to the curriculum target forces students to accept science concepts that they may not fully understand, leading to misconceptions (Jasin et al., 2023). One of the factors that influence the low level of science literacy at the elementary school level is the selection of learning media that does not explain the concept of science that is oriented toward science literacy (Avikasari et al., 2018). Often because teachers do not understand how to make learning media based on science literacy, it causes teachers to ignore learning media in doing learning (Maulidah & Sabtiawan, 2023). In addition, the low willingness of students to read books, especially at the elementary school level, is also a factor in the low ability of science literacy (Fuadi et al., 2020). Choosing and using learning media that is oriented towards the development of science literacy can be done as a solution to the problem of low science literacy.

One of the learning media that has been applied in the learning process in schools is digital books better known as e-books. A digital book or can also be called an e-book is a publication consisting of text, images, videos, and audio published in digital form that can be accessed through a computer or other electronic device (Ruddamayanti, 2019). According to Gal (2019), it can be seen that there is interest and increased learning motivation by students at the elementary school level, especially in grade 5 when using mobile learning such as digital technology on mobile phones, laptops, or computers. Therefore, introducing and growing science literacy skills in students will be helped by the use of digital learning media (Aiman et al., 2020; Khabiburrahman et al., 2022). However, the fundamental problem in the application of digital books is that teachers have not realized the importance of digital books in the current era of information and communication technology, and also teachers are not skilled in making these books (Handayani et al., 2020). From the explanation above, researchers will develop digital storybook learning media to increase students' scientific literacy which focuses on

material styles around us for fourth-grade students. The creation and selection of media to be developed must be by the needs of students because they will be used by students. Therefore, before developing learning media it is necessary to analyze needs first. This research aims to analyze needs as a first step in developing digital storybooks to improve students' scientific literacy skills.

METHODS

This research uses the type of research and development (R&D). This research uses the ADDIE model which consists of the stages of *Analysis, Design, Development, Implementation*, and *Evaluation* which is a learning design model that provides an organized process with the development of learning materials (Hamzah, 2019). This research only discusses the initial stage in the form of the *analysis* stage. The method of collecting information in this study is by literature studies and field studies that aim to identify learning products needed by students in schools (Hasanah et al., 2023; Pranoto & Suprayogi, 2020). Literature studies are carried out by collecting relevant research and sources and analyzing the curriculum used by schools. Meanwhile, field studies are conducted with interviews which are a form of interactive communication involving two parties with certain goals, following certain guidelines, and can be done directly or using communication devices or recorders (Melenia et al., 2022). The interview was conducted with grade IV teachers of SD Negeri 9 Prabumulih. Interview instruments can be seen in Table 1 below:

Table 1. *Interview Instrument Grid*

No	Indicators	Description	No Item	Information
1	Curriculum	Curriculum used	1	1. What curriculum is applied in fourth grade?
2	How to study	Learning that grabs students' attention	2	2. What kind of learning can attract the attention and enthusiasm of students?
3	Learning media/resources	• Frequently used learning resources • Results from the use of learning resources	3,4	3. What learning resources are often used by teachers in science learning activities? 4. What are the results of using learning resources used by teachers on students?
4	Science literacy	Application of science literacy	5,6	5. Have the learning activities that take place applied science literacy? 6. If so, how are teachers' efforts in implementing science literacy? If not, what is the reason?
5	Development of digital storybook media based on science literacy	• The need for innovative media in digital form • Digital storybooks in improving science literacy • Material on storybooks • Student interest in storybooks digital	7,8,9,10	7. Is there a need for innovative learning media in digital form? 8. Do you think digital storybook teachers can help students in doing science literacy? 9. Is it appropriate if a digital picture storybook is applied to the style material? 10. According to the teacher, will grade IV students be interested in digital picture book media?

RESULTS AND DISCUSSION

This study used data collection techniques by interviewing one of the fourth-grade elementary school teachers. In this study, interviews were used as an instrument to conduct initial analysis. The purpose of this interview is to obtain information related to the learning styles of students, learning resources used by teachers during teaching, the application of science literacy in learning, and material that will be included in digital storybook media.

Analysis of Student Characteristics and Learning Styles

Fourth-grade learners aged 9 – 11 years. This suggests that they are at a concrete operational stage, according to Piaget's theory, which means that their cognitive development is still linked to concrete objects that can be captured by the five senses (Hutasuhut & Armanto, 2022; Marinda, 2020). When science learning incorporates concrete objects or experimental activities that offer direct experience to learners, it allows them to develop systematic thinking during the learning process, because in essence students need the means to understand scientific concepts (Annisa & Simbolon, 2018).

Based on the results of an interview that was conducted with one of the fourth-grade teachers, information was obtained that "students have different learning styles, some understand better if explained directly, some through practice, some by listening or seeing", so this shows the learning styles of students are different. According to Kurniati et al. (2019), learning style is a method that explains how each individual strives to understand and master difficult and new information through different approaches and perceptions. It is proven that learning styles affect student learning outcomes and achievement (Irawati et al., 2021). There are three learning styles in this study that are based on the theory of Bobbi De Potter & Mike Hernacki, namely visual, auditory, and kinesthetic learning styles (Putri et al., 2021). The characteristics of the learning style described by Sulastri et al., (2022) namely visual learning styles have the characteristics, 1) careful and detailed, 2) easier to remember from what they see, 3) less able to concentrate; Auditory learning styles are characterized: 1) easily distracted by noise, 2) faster to absorb learning by listening, 3) like questions and answers and discussions; Kinesthetic learning style has the characteristics of 1) a lot of movement, 2) using body language, 3) easier to learn by direct practice.

The fourth-grade teacher stated that there were six students with visual learning styles, five students with auditory learning styles, and eight students with kinesthetic teaching styles. The characteristics and learning styles of students will be taken into consideration in developing digital picture book media.

Curriculum and Material Analysis

The curriculum used for the fourth grade is a Merdeka curriculum. Merdeka curriculum is a curriculum with diverse intracurricular learning where the content will be more optimal so that students have sufficient time to explore concepts and strengthen competencies (Kemendikbudristek, 2022). The concept of independence in the Merdeka curriculum means giving teachers the freedom to plan the learning process according to the needs and learning objectives (Sulistyosari et al., 2022, Subiyantoro & Arief, 2024) The material presented in the digital storybook is about the style around us, which is part of the science subject for fourth-

grade students in elementary school. Based on the results of interviews with fourth-grade teachers of SD Negeri 9 Prabumulih, the style material is abstract, so this digital storybook media will help them to understand abstract concepts and be realized in everyday life. The learning outcomes in this material that have been formulated by the Ministry of Education and Culture, and the learning objectives that have been developed can be seen in Table 2 below:

Table 2. *Learning Outcomes and Objectives*

Learning Outcomes	Learning Objectives
Demonstrate different types of forces and their effects on the direction, motion, and shape of objects	Learners demonstrate the basic concepts of style in everyday life
	Learners explain the influence of force on objects
	Learners explain the concept of frictional force
	Students apply frictional force in everyday life
	Learners conclude the application of style

Analysis of Science Literacy Skills

Science literacy is one of the skills that students need to master. Science literacy aims so that students have the ability in terms of knowledge and understanding of scientific concepts to participate in the community environment and students are expected to be able to identify problems in science learning in their daily lives (Prasetyo & Mahmud, 2020). A person can be said to have scientific literacy if he is willing to be involved in matters related to science and technology so he requires competence to explain scientific phenomena, evaluate and design scientific studies, and interpret scientific data and evidence (OECD, 2013). PISA divides scientific literacy into three aspects in its measurement, namely Identifying scientific issues, Explaining scientific phenomena, and Using scientific evidence (Bybee, 2009; Rohmawati & Gayatri, 2020).

Table 3. *Results of Science Literacy Skills*

Indicators	Percentage	Category
Identify scientific issues	48,3%	Low
Explaining scientific phenomena	42,5%	Low
Using scientific evidence	39,8%	Low
Average	43,53%	Low

Based on Table 3, it can be seen that the science literacy ability of fourth-grade students of SD Negeri 9 Prabumulih varies. The indicator identifying scientific issues obtained a percentage of 48.3%. The indicator explaining scientific phenomena obtained a percentage of 42.5%. And the indicator using scientific evidence obtained a percentage of 39.8%. The overall analysis results average students have a percentage of 43.53% with a low category.

Science literacy skills cannot be obtained in just a short time because it requires understanding the concepts, processes, and applications of science knowledge. Therefore, science literacy skills need to be taught since learners are in elementary school. The ability to read comprehension has a relationship or correlation with science literacy skills because reading can involve a mindset that can build a conceptual understanding and can support

inquiry and a culture of scientific thinking (Ayu et al., 2018). One factor that affects low science literacy at the elementary school level is the low willingness of students to read books, especially at the elementary school level (Fuadi et al., 2020). In addition, the selection of learning media that does not explain the concept of science-oriented to science literacy is also a factor in the low ability of science literacy (Harianto, 2023). Learning media that are not related to real-life causes students to find it difficult to associate the knowledge they gain with real-life situations. Choosing and using learning media that is oriented towards developing science literacy skills can be done as a solution to the problem of low science literacy.

Analysis of Teacher Needs

Interviews were conducted with fourth-grade teachers of SD Negeri 9 Prabumulih to find out the curriculum used, learning that attracts the attention of students, commonly used learning resources, the application of science literacy, and matters related to digital picture book media. The results of the interview can be seen in Table 4 below:

Table 4. *Teacher Interview Results*

No	Answers
1	Currently, the curriculum used for the fourth grade of SD Negeri 9 Prabumulih is independent
2	Students are more excited when learning that takes place using learning resources other than module books, especially the use of media from the internet
3	Learning resources commonly used for science learning are module books, and also the environment around the school
4	As a result of using these learning resources, almost 75% of fourth-grade students understand science material
5	The learning activities that take place already apply science literacy although only occasionally and also still a little
6	The application of science literacy is carried out through practical activities. But sometimes the lack of time and facilities causes learning to be unable to take place which increases students' scientific literacy
7	Very necessary, innovative learning media in digital form will certainly help increase student understanding
8	Media in the form of digital picture storybooks will certainly help improve students' science literacy, because reading activities can support literacy, especially there are pictures
9	The style material is abstract so it is suitable to be applied in digital storybooks so that it will help them to understand abstract concepts and be realized in everyday life.
10	Students will certainly be very interested, picture storybooks mean there will be pictures and colors so their attention will be focused on digital picture storybooks because they have never been applied to them before.

Based on the results of interviews with fourth-grade teachers at SD Negeri 9 Prabumulih, it was revealed that currently, the curriculum used in fourth-grade SD Negeri 9 Prabumulih has implemented an independent curriculum. Students are more excited when learning that takes place using learning resources other than books. According to Jonassen & Duffy (2013) related to learning resources, educators have a responsibility to help their students to learn and to learn easier, more interesting, more directed, and more fun. From the results of the interview, it is also known that the learning activities that take place have applied science literacy but are still limited. This is due to several factors, including limited time available in the learning schedule and limited facilities available at school. Because of these factors, learning that can improve students' science literacy becomes difficult to implement thoroughly. This is in line with the explanation of Sholikah & Pertiwi (2021) which revealed that one of the factors that affect children's literacy levels is the learning resources used in learning

activities. The completeness and variety of facilities in schools will support the acceleration of children's literacy learning process more efficiently (Kabariah & Adiyono, 2023; Marwiyati & Hidayatulloh, 2018; Tuhuteru et al., 2023). Therefore, one way to introduce and improve science literacy in learning is the need for media. Learning media will create effective and efficient learning, besides that students will also be interested and motivated in participating in learning activities (Fardiah et al., 2023; Suratmi et al., 2019). When the media presented is in the form of visual, audio, and music through digital media so that students can enjoy learning media at any time using their respective mobile phones or other electronic devices (Widodo et al., 2020). Learning with storybooks can help students learn independently and increase interest in learning (Farindhani & Wangid, 2019). Meanwhile, according to Sari & Wardani (2021), with the existence of a storybook, students are presented with an example of a character who can later provide support for students in learning the material contained in the story. Based on research conducted by Farendra (2018), storybooks can be a learning resource that supports science learning literacy for students. Science literacy skills can increase when students experiment with the knowledge they gain to learning, such as exposing or showing an object and then adjusting to the object in the school environment (Permata & Khusniyah, 2022). The material component in storybooks can help students to understand abstract concepts and be realized in everyday life (Susilaningrum & Wangid, 2019). Students will more easily absord the material with the help of storybooks. Digital storybooks can express what teacher cannot express through certain words or sentence.

CONCLUSION

Based on the results of the needs analysis that has been carried out, it can be concluded that it is necessary to develop learning media that can support students' learning process in practicing scientific literacy skills. Learning media that can be developed are digital storybooks based on scientific literacy. From the results of the needs analysis carried out, students are more enthusiastic when learning takes place using learning resources from the internet. Through this digital storybook, students can improve their scientific literacy skills anywhere and anytime. This is because in this digital storybook examples of characters will be presented who can later provide support in learning the material contained in the story and then adapting it to objects in the environment. Therefore, digital storybooks can be a solution for training students' scientific literacy skills in a fun way by utilizing technology.

CONFLICT OF INTEREST

We do not have any conflicts of interest to declare

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