

## Implementation of Scientific Literacy in The Independent Curriculum (Merdeka Curriculum) at Elementary School

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### Abstract

This research aims to describe and analyze the implementation of scientific literacy in the Independent Curriculum (Merdeka Curriculum) for elementary school. The steps include planning learning with scientific literacy, checking implementation of the Independent Curriculum, and evaluating the learning process with scientific literacy. The method used is descriptive qualitative. The subjects of this research were Headmaster and teachers at 2 State elementary school of Gumawang, East Ogan Komering Ulu (OKU). Data collection through observation, interviews and document analysis related to the implementation of scientific literacy in the Merdeka curriculum. The validity of the collected data was tested using data and source triangulation techniques. The research results show that the implementation of scientific literacy in the Independent Curriculum in 2 State elementary school of Gumawang has experienced significant development. This is demonstrated by (1) A learning approach based on inquiry and experimentation, (2) Implementation of learning designed to emphasize in-depth understanding of scientific concepts and their application in everyday life, (3) The evaluation process carries out three evaluations, namely in cognitive, affective and psychomotor domains. The implementation of scientific literacy in the Merdeka Curriculum at 2 State elementary school of Gumawang is already underway in several driving schools, but there are several challenges that must be faced, including the lack of resources and training for teachers in adopting a more interactive scientific literacy approach, this is because there are still many teachers who are not used to it. with innovative learning methods that adopt the application of scientific literacy. Observation results show that reading literacy in elementary education level students is one aspect that has not been fully implemented well. This is due to the lack of literacy among students. So the evaluation and measurement of scientific literacy skills needs to be improved to ensure the achievement of curriculum goals. This research provides an important contribution to understanding the implementation of scientific literacy in the Independent Curriculum at the elementary education level. The results of the research can be a basis for further development in efforts to improve the quality of education at the elementary level, with a focus on developing students' scientific literacy.

**Keywords:** Independent Curriculum, Scientific Literacy, Elementary School.

### Abstrak

*Penelitian ini bertujuan menggambarkan dan menganalisis implementasi literasi sains di Kurikulum Merdeka pendidikan dasar. Langkah-langkahnya mencakup perencanaan pembelajaran dengan literasi sains, pengecekan pelaksanaan pada Kurikulum Merdeka, dan evaluasi proses pembelajaran dengan literasi sains. Metode yang digunakan adalah kualitatif deskriptif. Subjek dari penelitian ini adalah kepala sekolah dan guru di Sekolah Dasar Negeri (SDN) 2 Gumawang, Ogan Komering Ulu (OKU). Pengumpulan data melalui observasi, wawancara dan analisis dokumen terkait implementasi literasi sains terhadap kurikulum Merdeka.*

*Data yang telah terkumpul diuji keabsahannya dengan teknik triangulasi data dan sumber. Hasil penelitian menunjukkan bahwa implementasi literasi sains dalam Kurikulum Merdeka di SDN 2 Gumawang telah mengalami perkembangan yang signifikan. Hal ini ditunjukkan dengan (1) Pendekatan pembelajaran yang berbasis pada inkuiri dan eksperimen, (2) Pelaksanaan pembelajaran yang didesain untuk menekankan pemahaman mendalam tentang konsep-konsep ilmiah dan penerapannya dalam kehidupan sehari-hari, (3) Proses evaluasi melaksanakan tiga evaluasi yaitu di ranah kogniti, afektif dan psikomotor. Implementasi literasi sains pada Kurikulum Merdeka di sekolah ini sudah berjalan di beberapa sekolah penggerak akan tetapi terdapat beberapa tantangan yang harus dihadapi diantaranya, kurangnya sumber daya dan pelatihan bagi guru dalam mengadopsi pendekatan literasi sains yang lebih interaktif, hal ini dikarenakan masih banyak guru yang belum terbiasa dengan metode pembelajaran inovatif yang mengadopsi penerapan literasi sains. Hasil observasi menunjukkan literasi baca pada siswa tingkat pendidikan dasar merupakan salah satu aspek yang belum sepenuhnya terlaksana dengan baik. Hal ini dikarenakan minimnya ubdaya baca dikalangan siswa. Sehingga evaluasi dan pengukuran kemampuan literasi sains perlu ditingkatkan untuk memastikan pencapaian tujuan kurikulum. Penelitian ini memberikan kontribusi penting dalam pemahaman tentang implementasi literasi sains pada Kurikulum Merdeka tingkat Pendidikan dasar. Hasil penelitian dapat menjadi dasar untuk pengembangan lebih lanjut dalam Upaya meningkatkan kualitas Pendidikan di tingkat dasar, dengan focus pada pengembangan literasi sains siswa.*

**Kata Kunci:** Kurikulum Merdeka, Literasi Sains, Pendidikan Dasar.

## INTRODUCTION

Basic education is the main foundation in building the future of a nation. In an era full of technological innovation, environmental challenges and rapid social change, scientific literacy is becoming increasingly important in the world of education. The ability to understand and apply is not only about mastering formulas and theories but also about developing a deep understanding of the world (Werdiningsih, 2021). In an effort to achieve learning goals, the Independent Curriculum at the basic education level has become the main focus in implementing scientific literacy into the learning process (Rahmadayanti & Hartoyo, 2022).

The Merdeka Curriculum is a historic breakthrough in the world of education in Indonesia, because an update is needed in the curriculum so that the Merdeka Curriculum becomes a new spirit in carrying out a policy transformation to make education governance better (Bungawati, 2022). The Independent Curriculum provides greater freedom to teachers and students in choosing learning methods that suit the needs of the local context and the Independent Curriculum aims to create education that is more relevant, effective and motivating (Ratnaningsih & Khairiyah, 2022). One of the key elements in curriculum changes is the emphasis on scientific literacy, which aims to train students to become individuals who think critically, analytically, and are able to participate in global issues.

Scientific literacy is one of the literacies that must be developed for the world of education, especially teachers because teachers as facilitators of students are required to innovate in developing the learning process and also students' literacy abilities, (Maryono, Pamela, & Budiono, 2021). Scientific literacy is an individual's ability to understand, analyze and use scientific information in everyday life (Irsan, 2021). Scientific literacy is an important component in educational development at all levels, including basic education. Scientific literacy means using special strategies needed to understand a scientific process which includes concepts, skills, understanding, knowledge values that are implemented throughout the learning process, (Küçükaydin, 2022). The definition of scientific literacy is the ability to apply the ability to apply understanding related to the learning process, identify questions, and draw evidence-based conclusions to real life situations to make the right decisions, (Yuliana, Cahyono, Widodo, & Irwanto, 2021). The following are several reasons why scientific literacy needs to be implemented in the Merdeka curriculum at the basic education level, (1) increasing scientific understanding, (2) developing critical thinking skills, (3) preparation for future challenges, (4) developing interest and knowledge, (5) student empowerment, (Setiawan et al., 2022).

The implementation of scientific literacy in the independent curriculum at the basic education level requires careful planning, implementation and evaluation. Teachers need to have a strong understanding of scientific literacy and how to implement it into a more flexible curriculum (Subayani, 2022). The application of scientific literacy in the Merdeka curriculum at the basic education level can help create a generation that is more knowledgeable, thinks critically, and is ready to face increasingly complex future challenges in a science-based society.

Interesting facts at the research location related to scientific literacy can involve the uniqueness of the basic education curriculum at 2 State elementary school of Gumawang. For example, there are special or innovative approaches in implementing scientific literacy in the Independent Curriculum, which can be the focus of research. In addition, the level of involvement of students and teachers in scientific literacy activities, local government support, or the positive impact that has been seen in increasing students' understanding of science could be interesting aspects to explore in this research (Observasi, 2023).

This research is similar to several previous studies which also raised the issue of implementing the Independent Curriculum at the Basic Education level. Firstly, research was conducted by Hernawan & Mulyati (2023) with a research focus on the Implementation of the Independent Curriculum in Elementary Schools in developing the profile of Pancasila Students. Meanwhile, research conducted by Wijayanti & Ekantini (2023) focused on the implementation of the independent curriculum in elementary school science learning. Isa, Asrori, & Muharini (2022) conducted research with a focus on the role of school principals in implementing the independent curriculum in elementary schools. As well as research conducted by Heryahya, Herawati, Susandi, & Zulaiha (2022) which analyzed the readiness of elementary school teachers in implementing the independent curriculum.

Referring to several studies that have been conducted previously, there has been no research that focuses on discussing the application of scientific literacy. Therefore, this research enriches research on the implementation of the independent curriculum in elementary schools. This research has a main difference and provides novelty by focusing on aspects of scientific literacy in the context of implementing the Merdeka Curriculum in elementary school. Thus, this research can provide new insights regarding how scientific literacy is integrated and implemented in the curriculum to improve students' understanding of scientific concepts.

## **RESEARCH METHOD**

This research is included in the qualitative research category. This research describes the implementation of scientific literacy in the Independent Curriculum at the elementary school level. Qualitative research is a research process to understand human or social phenomena that interact with each other and then create an overall and complex picture. Qualitative research is also research that can be carried out with certain rules that exist in real life or naturally occur with regulations. the purpose of understanding the phenomena that occur (Fadli, 2021).

The subjects of this research were class teachers and school principals at 2 State elementary school of Gumawang who were informants who were asked to provide data related to the research object. The data that had been collected was regarding the implementation of scientific literacy in the Independent Curriculum at the elementary education level 2 State elementary school of Gumawang, East Ogan Komering Ulu (OKU). Data collection techniques, namely using observation, interviews and documentation, were used to find out about the implementation of scientific literacy in the Independent Curriculum at the elementary school. This research determines data validity techniques using data and source triangulation techniques. The process of triangulating data and sources by comparing and checking the degree of trustworthiness of the information obtained. Data validity techniques are not only used to refute accusations against research concepts.

## **RESULT AND DISCUSSION**

### **Planning for the Implementation of Scientific Literacy in the Independent Curriculum at Elementary School**

Data collection was carried out at elementary school in East OKU, namely at 2 State elementary school of Gumawang. The results of this research were obtained through observations carried out involving informants, who underwent interviews with class teachers at the basic education level at East OKU. The focus of this research is related to evaluating the implementation of scientific literacy in the Merdeka curriculum. Apart from that, this research also covers the process of designing learning tools, especially in the form of teaching modules. The learning modules prepared by educators have actually made a significant contribution to efforts to implement scientific literacy. According to a class teacher who participated in creating teaching modules for scientific literacy in the implementation of the Independent Curriculum, he stated,

“The process of developing teaching modules has made a significant contribution to the progress of scientific literacy in the classroom. This module not only facilitates understanding of scientific concepts,

but also encourages students' active involvement in knowledge exploration. I am confident that through this approach, we can achieve the curriculum goals more effectively, providing a solid foundation for the development of students' scientific literacy. This module not only provides theoretical knowledge, but also provides in-depth practical experience. In addition, we ensure that each material is designed in language that is easy for students to understand, so that they can easily access and internalize complex science concepts" (Interview, 2023).

Based on the results of the interview above, the teaching module implementing scientific literacy was designed by considering several important principles and elements to be effective in developing scientific understanding and scientific literacy skills. Several elements that have been included by the teacher in designing the teaching module include: (1) learning objectives, (2) relevant context, (3) scientific questions, (4) clear sources of information, (5) critical analysis, (6) critical thinking skills, (7) active involvement and (8) use of technology. The scientific literacy teaching module that has been designed supports the development of students' in-depth understanding of science and scientific thinking skills. This agrees with the opinion that the teaching modules designed must be relevant to students' scientific development and can be adapted according to students' needs and level of understanding (Ratih Purnama Pertiwi & Dewi, 2023; Sugiarto, Nurdyansyah, & Rais, 2018; Zulkifli & Royes, 2017).

The learning planning outlined in the teaching module created by the teacher can be used in six meetings, where each meeting contains material that must be presented according to the student's level of understanding. The class teacher also said that in the process of creating teaching modules, they attempted to create differentiated modules, taking into account the needs and ability levels of the various students in the class. He explained,

"I believe that every student has a different learning style. Therefore, the teaching modules that we design are tailored to the individual characteristics of students, both in terms of speed of understanding and level of difficulty of the material. This aims to provide maximum support and increase understanding of science concepts, so that each student can achieve their potential optimally" (Interview, 2023).

Based on this statement, creating differentiated teaching modules is crucial in increasing the effectiveness of scientific literacy learning at the basic education level. By adapting modules to diverse learning styles and student ability levels, this approach not only supports the principle of inclusion, but also provides targeted support for each student (Anwar & Sukiman, 2023; Herwina, 2021). Differentiated modules encourage active student involvement, avoid boredom or frustration, and stimulate interest in science. Thus, creating differentiated teaching modules is not only a response to student needs, but also a crucial strategy in creating a dynamic learning environment and improving the overall quality of scientific literacy learning.

Differentiated teaching modules have learning principles including; (1) learning environment, (2) quality curriculum, (3) continuous assessment, (4) responsive teaching, (5) leadership and classroom routines, (Gusteti & Neviyarni, 2022; Madani, Sirait, & Oktaviany, 2023). Schools that have created differentiated teaching modules are driving schools in East OKU, one of which is 2 State elementary school of Gumawang, where teaching modules can help meet students' needs better, allowing students to grow and develop according to the student's level of ability in the learning process.

### **Implementation of Learning by Implementing Science Literacy in the Independent Curriculum**

The results of interviews with school principals stated that the implementation of learning at the basic education level had carried out learning by implementing scientific literacy into the learning process,

"Many teachers in our schools have actively used learning models to increase scientific literacy, especially in implementing the Independent Curriculum. This approach has had a positive impact on student participation in science learning. Teachers have creatively integrated various interesting learning models to provide a deeper and more relevant learning experience for students in our schools" (Interview, 2023).

In the context of 2 State elementary school of Gumawang, the implementation of learning models by teachers has shown a significant positive impact on increasing students' scientific literacy, in accordance with the demands of the Independent Curriculum. The principal stated that many teachers were creative in integrating various learning models, creating a dynamic and interactive learning environment. This not only increases student participation in the learning process, but also has a positive impact on student learning

outcomes, along with increasing their understanding of science concepts. The innovative adaptation of the Merdeka Curriculum and the emphasis on teacher creativity provide an illustration of how appropriate learning strategies can have a positive impact in increasing scientific literacy at the elementary school level.

Based on the results of observations of class teachers, the following are the learning implementation steps that have been carried out by teachers to implement scientific literacy in the learning process, (1) Convey learning objectives to students, (2) convey material that is relevant to the latest scientific concepts and real world problems, (3) facilitate students to discuss, (4) conduct experiments according to the material presented, (5) focus on scientific reasoning, (6) active involvement. The implementation of scientific literacy in the classroom is carried out during the learning process, namely 15 minutes before the learning process and also strengthens student character education (Observasi, 2023). This agrees with the statement from research which states that the process of implementing scientific literacy lasts for 15 minutes and is implemented in learning and contained in teaching modules (Nofiana & Julianto, 2018; Nuro, Suwandayani, & Majid, 2020).

The implementation of Scientific Literacy in the Merdeka Curriculum at 2 State elementary school of Gumawang reflects the school's commitment to increasing students' understanding of scientific concepts through an inquiry and experiment-based approach. The learning planning process is carried out by utilizing an inquiry approach, which provides space for students to actively search, discover and understand scientific concepts independently. Learning activities are designed in such a way that the provision of material is integrated into the curriculum, emphasizing a deep understanding of scientific concepts and their application in everyday life. In addition, an experimental approach is actively applied, allowing students to engage in hands-on practical activities that develop scientific thinking and problem-solving skills. The evaluation process involves three domains, namely cognitive, affective and psychomotor, to ensure students' understanding not only at the level of knowledge, but also in aspects of attitudes and skills. Thus, the implementation of Scientific Literacy in the Merdeka Curriculum at 2 State elementary school of Gumawang not only supports learning scientific concepts, but also develops students' skills in applying this knowledge in everyday life situations.



**Image I.** Process of Implementing Science Literacy Learning

The implementation of learning in the classroom in the picture shows that the learning process involves students directly during the learning process. Based on documentation of the learning implementation process at 2 State elementary school of Gumawang, the learning implementation has implemented scientific literacy including: (1) before implementing scientific literacy during the learning process the teacher has received training on teaching scientific literacy, (2) the teacher has developed learning materials that encourage understanding of concepts scientific, critical thinking skills, and understanding of the material, (3) teachers use various sources of information including books, websites, (4) students are taught to communicate their findings or understanding in the form of scientific methods in the form of reports and present them, (5) Students are asked to discuss and debate in class to help develop students' deeper understanding of the material presented. The learning implementation has implemented scientific literacy in learning so that it can develop

a strong understanding of science and the ability to make decisions based on scientific evidence in everyday life.

The learning process at the basic education level is the initial activity in the learning process so that the implementation of learning must be carried out as well as possible because errors that occur in learning at the basic level can cause difficulties at higher levels of learning (Andesta, 2018; Nahak, Degeng, & Widiati, 2019). Therefore, cooperation between teachers and parents is very important in implementing elementary level student learning (Khosiah, Susandi, & Dheasari, 2021). The implementation of scientific literacy is very important because scientific literacy has several functions, including scientific knowledge, being able to identify questions and being able to draw conclusions according to actual circumstances (Destrinelli et al., 2020; R. P. Pertiwi, Enggar, Dewi, & Sinensis, 2022).

### **Evaluation of Learning Implementation of Scientific Literacy in the Independent Curriculum**

In the results of interviews with several class teachers at the elementary education level at East OKU, as stated by one of the teachers,

"The evaluation or assessment process that we carry out is not only a tool to assess student understanding, but also as an effort to implement scientific literacy at the basic education level. We believe that the evaluation process is very important to ensure the achievement of learning objectives, especially in the context of the Independent Curriculum. Therefore, every assessment step that we implement is designed by considering aspects of scientific literacy, creating integrity between learning and assessment" (Interview, 2023).

The implementation of the evaluation carried out by the teacher consists of several stages including: (1) determining learning objectives and aligning them with clear evaluations in accordance with the competencies that have been determined, (2) the evaluation includes components of scientific literacy, namely, understanding concepts, the ability to collect data and analyze data, think critically, communicate science and apply science in everyday life, (3) create evaluation rubrics that are clearly measurable and students understand the criteria for assessment, (4) create formative assessments to be used during the learning process and can provide feedback to students and helping students improve their understanding of the material, (5) involving students in the evaluation process by discussing learning objectives, providing feedback, and inviting students to carry out experiments, (6) timeliness of evaluations carried out at times appropriate to the curriculum to ensure students have sufficient understanding before providing further material, (7) asking students to evaluate themselves, the aim is to identify whether the learning approach and learning resources used are effective in increasing students' scientific literacy. The scientific literacy assessment carried out can assess students' understanding of the application of scientific concepts and processes as well as the content of scientific applications, the content in the implementation of scientific literacy is the curriculum used and material that contains understanding of concepts and abilities applied in everyday life, (Adawiyah & Wisudawati, 2017; Zahro, Atika, & Westhisi, 2019).

Evaluation is the process of describing and perfecting information and processes, this process is carried out systematically and planned in accordance with applicable procedures and rules, this is the same as the statement about evaluation is a component of the education system which is carried out systematically and planned as a tool used to measure success achieved in the educational process (Prastowo, 2018; Zamzania & Aristia, 2018). Evaluation is a component of the education system.

### **Learning Challenges in Implementing Scientific Literacy in the Independent Curriculum**

The implementation of scientific literacy in the Merdeka curriculum at the primary education level in East OKU faces a number of challenges that need serious attention. The first challenge is the lack of adequate resources and training for teachers in adopting a more interactive science literacy approach. Many teachers may not be familiar with learning methods that promote scientific literacy, and thus require more intensive support and training to implement them effectively in the classroom. In an interview, a class teacher stated,

"I feel that there are significant obstacles related to the lack of adequate resources and training to adopt a more interactive approach to scientific literacy in the classroom. Many of us teachers may not be fully familiar with these learning methods that promote scientific literacy. Therefore, we felt the need for more intensive support and training to be able to implement it effectively in the classroom. As our learning approaches evolve, we want to be able to ensure that our students not only understand science concepts, but can also apply them in their daily lives" (Interview, 2023).

Furthermore, evaluating and measuring scientific literacy abilities is also an important focus. Efforts are needed to improve relevant and adequate evaluation tools to measure student progress in achieving the desired scientific literacy competencies (Putra & Idawati, 2017; Winaryati, 2018). This will ensure that the curriculum is not only implemented formally, but also has a significant impact on increasing students' scientific literacy.

Research also reveals that reading literacy in students at primary education level is one aspect that has not been fully implemented well. The lack of reading culture among students results in low levels of reading literacy (Observation, 2023). Therefore, it is necessary to emphasize the importance of developing reading habits among students from an early age. Efforts to increase reading literacy must be integrated into learning strategies and involved comprehensively at the school level.

Overall, to address these challenges, investments in teacher training, resource development, and improved science literacy evaluation tools are needed. Also, the importance of creating a learning environment that motivates students to read by improving the reading culture in schools. Thus, it is hoped that these steps can make a positive contribution to increasing the implementation of scientific literacy in the Independent Curriculum at the basic education level.

## CONCLUSION

The research concluded that the implementation of scientific literacy in the Independent Curriculum at the elementary education level in East OKU experienced significant development. The research results show clear progress in the implementation of scientific literacy in the Independent Curriculum at the basic education level. The process of planning and implementing learning has used a learning approach based on inquiry and experimentation. Implementation of learning activities when providing material that is integrated into the curriculum is also designed to emphasize a deep understanding of scientific concepts and their application in everyday life. The evaluation process carries out three evaluations, namely in the cognitive, affective and psychomotor domains. The implementation of scientific literacy in the Independent Curriculum has several challenges that must be faced, including a lack of resources and training for teachers in adopting a more interactive scientific literacy approach. In addition, evaluation and measurement of scientific literacy abilities need to be improved to ensure the achievement of curriculum goals. Researchers found cases of literacy that had not been implemented well regarding reading literacy among students at the elementary education level. The lack of reading culture among students results in students' reading literacy levels being low. Researchers hope that this research will continue to create a learning module that implements scientific literacy at the basic education level.

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