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THE EFFECT OF SCIENCE LITERACY ON STUDENTS' SCIENTIFIC ATTITUDES IN SCIENCE SUBJECTS IN GRADE 5

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Abstract
This study aims to analyze the relationship between science literacy ability and scientific attitude of grade 5 students in science subjects at SDN Ciracas 06, East Jakarta. The sample in the study consisted of all grade 5 students of SDN Ciracas 06 East Jakarta. This study uses quantitative data analysis techniques with an inferential statistical approach, which includes correlation test, linear regression test, and linearity test. The results showed that students' science literacy skills were in the very good category with an average score of 85, while students' scientific attitudes were classified as good with an average score of 68. The correlation test showed that there was a strong positive relationship between science literacy and scientific attitudes, with a correlation value of 0.496. This indicates that the higher the student's science literacy ability, the better the scientific attitude they have. The results of the linear regression test showed that science literacy contributed 24.6% to the development of students' scientific attitudes. In addition, the linearity test shows that the relationship between these two variables is linear. The conclusion is that improving students' science literacy skills in science subjects has a positive correlation so that it is in line with improving scientific attitudes. This research has important implications for science teaching in elementary schools, especially in creating an active classroom atmosphere and supporting the development of science literacy and students' scientific attitudes. Teachers are advised to continue to apply interesting and interactive learning methods to improve both aspects. Students, as future generations, need to develop science literacy and a good scientific attitude to face technological developments. This research is expected to be the basis for further research to obtain more accurate and useful results.
Keywords: *Science literacy; students' scientific attitudes; science*

Abstrak
Penelitian ini bertujuan untuk menganalisis hubungan antara kemampuan literasi sains dan sikap ilmiah siswa kelas 5 pada mata pelajaran IPA di SDN Ciracas 06, Jakarta Timur. Adapun sampel dalam penelitian terdiri dari seluruh siswa kelas V SDN Ciracas 06 Jakarta Timur. Penelitian ini menggunakan teknik analisis data kuantitatif dengan pendekatan statistik inferensial, yang mencakup uji korelasi, uji regresi linier, dan uji linearitas. Hasil penelitian menunjukkan bahwa kemampuan literasi sains siswa berada pada kategori sangat baik dengan rata-rata nilai 85, sedangkan sikap ilmiah siswa tergolong baik dengan rata-rata nilai 68. Uji korelasi menunjukkan adanya hubungan positif yang cukup kuat antara literasi sains dan sikap ilmiah, dengan nilai korelasi 0,496. Hal ini mengindikasikan bahwa semakin tinggi kemampuan literasi sains siswa, semakin baik sikap ilmiah yang dimiliki. Hasil uji regresi linier menunjukkan bahwa literasi sains memberikan kontribusi sebesar 24,6% terhadap perkembangan sikap ilmiah siswa. Selain itu, uji linearitas menunjukkan bahwa hubungan antara kedua variabel ini bersifat linier. Kesimpulannya bahwa peningkatan kemampuan literasi sains siswa dalam mata pelajaran IPA memiliki korelasi positif sehingga sejalan dengan peningkatan kemampuan sikap ilmiah. Penelitian ini memberikan implikasi penting bagi pengajaran IPA di sekolah dasar, terutama dalam menciptakan suasana kelas yang aktif dan mendukung perkembangan literasi sains serta sikap ilmiah siswa. Guru disarankan untuk terus menerapkan metode pembelajaran yang menarik dan interaktif untuk meningkatkan kedua aspek tersebut. Siswa, sebagai generasi masa depan, perlu mengembangkan literasi sains dan sikap ilmiah yang baik untuk menghadapi perkembangan teknologi. Penelitian ini diharapkan dapat menjadi dasar bagi penelitian selanjutnya guna memperoleh hasil yang lebih akurat dan bermanfaat.
Kata Kunci: Literasi sains; sikap ilmiah siswa; IPA

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Introduction

Based on Law of the Republic of Indonesia Number 20 of 2003, Chapter 1 Article 1, education is an effort that is made consciously and planned to create a learning atmosphere and learning process that allows students to develop their potential. The goal is for them to have religious spiritual strength, self-control, personality, intelligence, noble character, and skills that are useful for themselves, society, nation, and state (Taher et al., 2023). The implementation of education is based on religious values, culture, and the demands of changing times. Education is organized through various levels, such as elementary schools (SD), junior high schools (SMP), high schools or vocational schools (SMA/SMK), to universities.

In general, education aims to form and develop the personality, abilities, and faith of students who are noble, knowledgeable, creative, independent, and responsible. Education is not only measured based on cognitive ability, but also through the application of moral values that are reflected in daily behavior (Hayati, 2018). At the elementary level, educational goals are divided into general and special goals including the formation of students to become good citizens, have the ability to compete, knowledge, productivity, a positive attitude towards science and think creatively, rationally, objectively and awareness of the rules by Ihsanudin (in Hayati, 2018).

In order for this goal to be achieved, the educational curriculum must adapt to the times. In the era of Society 5.0 introduced by Japan in response to the industrial revolution 4.0, technological innovations such as artificial intelligence and big data are used to improve the quality of human life by Williamson (in Mega, 2022). Society 5.0 encourages collaboration between humans and technology in all aspects of life, including education.

At the elementary level, Natural Sciences (IPA) subjects are taught starting from grade 4. Science learning aims to develop understanding, skills, and positive attitudes towards the interaction between natural sciences and other sciences, as well as the role in environmental conservation (Permendiknas Number 27 of 2006). For this reason, science learning must be contextual with the surrounding phenomena to improve science literacy, namely the ability to understand, communicate, and apply science knowledge. This literacy is important to form a generation that is sensitive to the environment and able to solve scientific problems (Mardianti, 2020). However, Indonesia's science literacy score based on PISA 2022 is ranked low. This shows that students are not yet able to understand and apply science concepts in daily life through speech, writing, and attitude. Research also found that teachers' teaching materials are often less relevant to the environmental context (Arlis et al., 2020 ; ALIM, 2019).

This study highlights the limitations of students' science literacy which is reflected in their low ability to understand science concepts in science lessons to the contribute of students' mindset scientific attitude and interest in learning. Many students have difficulty analyzing information during classroom experiments, which has an impact on their inability to explain science phenomena contextual or non-contextual (Muliani, 2023). Most elementary schools do not implement science literacy-based learning, so students are only used to answering questions by memorizing theories without conducting in-depth analysis (Alali & Al-barakat, 2024). As a result, students' learning outcomes are less satisfactory because they are not used to seeking the truth of information independently (Putri et al., 2023).

The lack of understanding of science literacy is also caused by the lack of teachers' ability to direct learning which encourages students to think critically, scientific behavior and solve new problems thus affecting students' cognitive and affective learning outcomes. Teachers rarely give students the opportunity to interact directly with natural phenomena using scientific processes. This condition makes students lose confidence, interest in science, and good scientific thinking skills, as well as increase the risk of misconceptions in the science concepts studied (Mafarja & Mohamad, 2024 ; Limiansih et al. 2024).

Students' difficulties in science literacy can be seen from their weak ability to interpret data in the form of graphs or images into sentences. They have problems understanding visual information because they are used to receiving data in written or oral form only (Bórquez-sánchez, 2024 ; García-carmona, 2023). The study also found that the lack of science literacy affected students' scientific attitudes, which was seen from the low active participation in classroom experiments. Although teachers have provided space for discussion and practice opportunities, many students rely solely on theories from books without relating to direct observation. This causes them to answer questions in a hurry and are not confident when presenting results in class (Khotimah et al., 2024).

Science literacy plays a crucial role in equipping students with critical thinking and a deep scientific attitude undertanding. However, data from various studies show that students' science literacy skills in Indonesia are still low, especially at the elementary school (SD) level. Based on the results of the Programme for International Student Assessment (PISA), the science literacy ability of Indonesian students is ranked low among the participating countries. In addition, the survey results show that science learning in many schools still focuses on memorizing theories without giving students the opportunity to conduct scientific exploration. This is a serious concern because science literacy skills are not only important for academic achievement, but also build a critical, rational, and open scientific attitude to change.

The urgency of this research can also be seen from the importance of science literacy in facing the challenges of the 21st century and the Society 5.0 era which requires critical thinking skills, problem-solving, and decision-making based on scientific evidence. The lack of application of learning methods that encourage science literacy in elementary school will hinder students in developing the scientific attitude needed to become active, creative, and solution-oriented individuals in facing real problems in society.

Then the novelty of this research is: (1) Research conducted by Efendi et al. (2021) entitled "Literature Study of Science Literacy in Elementary Schools" using a study of 20 research articles through Google Scholar with the keyword science literacy in Indonesia. The research has similarities with the research being conducted because it both discuss science literacy in elementary schools, but more specifically for 5th grade students of SDN Ciracas 06. The difference lies in the data collection method; Efendi et al's (2021) research only uses online journals with certain criteria, while the research conducted uses multiple-choice tests and questionnaires to quantitatively measure students' science literacy. (2) Kadir's (2017) research entitled "The Relationship of Critical Thinking Ability in Science Literacy Ability in Grade IV Elementary School Students" used an experiment with a 2x2 treatment by level design and two-path variance analysis (ANAVA). The research is similar to the research conducted because it assesses the science literacy of elementary school students with a multiple-choice test. However, the difference is that Kadir's (2017) research uses a special learning method and compares the control class and the experimental class, while the research conducted does not use special treatment and assesses the relationship between science literacy and all aspects of scientific

attitudes. (3) Research by Safar et al. (2023) entitled "Science Literacy Ability of Elementary School and Madrasah Ibtidaiyah Students Based on Learning Style and Gender" uses a comparative quantitative method with a simple random sampling technique to grade V students in Ternate City. The research is different from the research conducted in terms of data collection. Safar et al. used two instruments in the form of cognitive tests and questionnaires that considered learning styles and gender, while the research conducted only used test questions without the limitation of external factors. In addition, the research being conducted aims to measure the relationship between science literacy ability and scientific attitudes on various science materials without focusing on specific factors such as gender or learning style.

Based on observations in grade 5, the obstacle in learning science is the low science literacy of students. The solution that can be done is to instill a scientific attitude through discussions and experiments to improve students' cognitive understanding and positive attitudes. Scientific attitudes such as curiosity, critical thinking, and objectivity support the achievement of better learning outcomes. Therefore, this study focuses on the relationship between science literacy and scientific attitudes of grade 5 students at SDN Ciracas 06 Pagi, with the aim of examining the extent to which science literacy affects the development of scientific attitudes in science learning.

Research Methods

This study applies a quantitative approach. According to Cresswell, the quantitative approach is a research method that utilizes data in the form of numbers to collect and analyze information with the aim of explaining and testing the relationships between variables through a statistical approach (Jailani, 2023). The method used in this study is quantitative descriptive with a correlational approach. Sugiyono explained that descriptive research is a type of research that formulates a problem through the submission of questions to one or more variables to be studied (Sihotang, 2023). Meanwhile, correlational research aims to investigate the relationship and difference in indicators between two or more variables.

This research offers a new perspective in understanding and measuring the cause-and-effect relationship using innovative analysis methods. The main purpose of the study is to study the relationship between variables in certain groups. Researchers only focus on observing the conditions that occur when the research is carried out without affecting the results. This study also aims to determine the magnitude of the relationship between variables, especially to find out whether there is a relationship between science literacy and scientific attitudes in science subjects in grade 5 elementary school. In the design of this study, the independent variable is science literacy, while the bound variable is scientific attitude.

The population in the study refers to the entire subject that has certain characteristics that are determined by the researcher as the object of study to be analyzed and drawn conclusions (Sihotang, 2023). In this study, the population in question is all grade V students in science subjects for the 2023/2024 school year at SD Negeri 06 Pagi. This population consists of two classes with a total of 64 students. According to Sugiyono (in Suriani & Jailani, 2023), a sample is a small part of the population that has certain characteristics that can be used to describe the population as a whole through specific sampling techniques. In this study, the sample includes all students in grades V-A and V-B at SD Negeri Ciracas 06 Pagi, with a total of 64 students. The saturation sampling technique was used in this study. Sugiyono (Sihotang, 2023) defines the saturated sampling technique as a sampling method in which the entire population is sampled when the number of the population is relatively small, namely less than 30 people. This approach aims to minimize the error rate in sampling. According to the sampling theory, if the

population is less than 100 people, then the entire population can be used as a research sample. However, if the number is more than 100 people, then it is enough to take 10-25% of the total population. In this study, the population was only 64 students, making the entire population used as a research sample.

Data collection techniques are: (1) Science literacy, conceptually, is defined as a person's ability, skills, and knowledge in language, understanding concepts, and solving problems related to science. Science literacy has become a very important skill for students because of the demands of technological and scientific developments. To improve science literacy, students need to be trained in scientific identification, browsing literature, carrying out experiments, processing and understanding the data obtained, and drawing conclusions to find solutions to the problems faced (Herdiana & Sunarno, 2021).

Operationally, science literacy includes skills in understanding and applying scientific concepts and scientific processes that are relevant to daily life. This involves using supporting evidence to make decisions regarding specific issues. Factors that affect science literacy include approaches in teaching, experience, interest, and support from the community. According to Pertiwi (in Noor, 2020), science literacy and scientific attitudes significantly support the improvement of students' cognitive and affective learning outcomes. In science learning, science literacy focuses on applying meaningful science concepts, critical thinking, and joint decision-making to solve problems relevant to students' lives.

The science literacy instrument used in this study is a multiple-choice test with 20 questions. Multiple-choice tests, in this case, serve as a tool to evaluate a student's abilities, knowledge, intelligence, and skills. Multiple-choice tests were chosen to test science literacy skills because they can measure various aspects of knowledge and understanding efficiently and objectively. Science literacy is measured based on certain indicators listed in the instrument grid, and the questions are distributed after learning is complete. Testing the validity and reliability of the instrument is carried out to ensure that the test can measure exactly what is to be measured. Item validity, according to Utomo (2019), refers to the extent to which the content of the test is able to measure the objectives that should be measured. Question items are considered valid if the resulting score shows a correlation with the total score. In this study, measuring the validity of the test instrument was carried out by testing the test instrument to several students to find out which items were valid or invalid so that they could be corrected to be valid. This validity measurement was carried out before the research began using the product moment correlation formula based on rough numbers.

The next data collection technique, (2) Scientific Attitude Instrument conceptually, scientific attitude refers to the tendency of individuals to act and feel something towards an object in a certain way. Calhoun, as quoted by Hendracipta (Anindiya et al., 2019), explained that attitude is a combination of tendencies to act and feelings inherent in a person towards certain objects. A good scientific attitude, as stated by Utomo (2019), reflects the ability and motivation of students to continue learning and develop their personalities in order to achieve success and excellence. In the context of science learning, scientific attitudes include curiosity and objectivity that are used to dig up scientific facts. This attitude contributes to the formation of a better scientific understanding (Sulistyo et al., 2023).

Operationally, scientific attitudes in science learning in elementary schools aim to instill an attitude like a scientist. Susanto (in Olua, 2022) mentioned that children who have a scientific attitude will be guided to become individuals who are full of curiosity and passionate about exploring new things. Some aspects that can be developed in students include curiosity, never

giving up, free of prejudice, self-awareness, responsibility, free thinking, and discipline. These attitudes are important to be fostered through discussion, experiments, simulations, and class projects that are appropriate to the student's cognitive level.

The instrument used to measure students' scientific attitudes is observation using a questionnaire or questionnaire consisting of 20 questions. The questionnaire is compiled based on scientific attitude indicators and distributed after learning is completed. The grids and rubrics of this instrument are presented in a special table.

Testing the validity and reliability of the instrument is carried out to ensure that the test can measure the right aspects. The validity of the item, according to Utomo (2019), shows the extent to which the content of the test is able to reflect what should be measured. A question is considered valid if the resulting score correlates with the total score. To measure this validity, a product moment correlation formula based on rough data is used.

The Data Analysis Technique obtained from this study is quantitative, which is then analyzed using inferential statistical analysis techniques. This analysis includes correlation tests and linear regression tests that aim to test hypotheses and obtain analysis results. Inferential statistics is a branch of statistics used to analyze sample data with the aim of drawing conclusions that can describe the population (Sihotang, 2023). Based on the results of the analysis, conclusions will be drawn according to the data obtained, namely: (1) Product Moment Correlation Test is a correlation that has a measure of the relationship between two or more variables expressed in the degree of closeness of the relationship between variables. The degree of this relationship is measured using the correlation coefficient r. (2) The Linear Regression Test is a Regression that has a method to measure the relationship between two or more variables, expressed in the form of mathematical functions.

This relationship model is expressed by the equation Y=f(X)Y = f(X)Y=f(X), where linear regression shows that the relationship between the free variable (X) and the bound variable (Y) is linear, i.e. to the power of one. The simple linear regression equation is y=A+Bxy = A + Bxy=A+Bx. (3) The linearity test is used to determine whether the relationship between free and bound variables is linear. This test is a prerequisite in simple and multiple linear regression analysis. The linearity test was carried out using SPSS 23 software with a "test of linearity" test at a significance level of 0.05. The linearity criteria are as follows: if the significance value is greater than 0.05, the data is considered linear; if Fcal < Ftable, the data is also declared linear.

To test the alternative hypothesis (Ha), a null hypothesis (H0) is needed as a comparison. The null hypothesis (H0), often referred to as the statistical hypothesis, is a statement regarding the value of one or more parameters that are considered to be initial conditions. This hypothesis is only rejected if the sample data provides strong evidence that the statement is false. H0 : $\rho = 0$ -> There is no relationship between science literacy and scientific attitudes in science subjects in grade V elementary school even semester

Ha : $\rho \neq 0$ -> There is a relationship between science literacy and scientific attitudes in science subjects in grade V elementary school even semester

Results and Discussion

Based on research conducted at SDN CIRACAS 06, the results of this study include science literacy and scientific attitudes. This study uses a test instrument in the form of multiple-choice questions as many as 22 items that have been designed and tested for validity. The test instrument is used to measure the level of students' science literacy ability. In addition to the test, a questionnaire instrument consisting of 34 statements was also used to determine the ability of students' scientific attitudes. Then this study aims to identify the relationship between

aspects of science literacy skills and scientific attitude skills in science subjects class V odd semesters. The average science literacy ability reached 85, while the scientific attitude was 68, as listed in Table 1.

Table 1. Recapitulation of the results of the analysis of science literacy skills and scientific attitudes

Variabel	n	Maks	Min	Rata-rata	Kategori
Literasi sains	63	100	68	85	Sangat Tinggi
Sikap Ilmiah	63	84	60	68	Tinggi

Based on the values in table 1, the data obtained from the analysis results show that the average score of students' science literacy skills is 85 which is included in the very high category with the highest number of scores of 100 while the lowest score is 68. The average scientific attitude ability of students in the high category is with a score of 68, with the highest score of 84 and the lowest score of 60. So that science literacy skills are included in the very high category. This ability is one of the types of basic literacy competencies measured in the PISA test. The results of the analysis showed an average percentage of basic literacy skills of 85.4%, which is very good. However, this result is not in line with the 2022 PISA report which shows a decrease in science literacy skills compared to 2018.

Research by Zuhrotul et al. (2023) on the science literacy competency profile of high school students on atomic materials and radioactivity found that the average science literacy ability is in the fairly good category. The science literacy aspects tested include the identification of valid scientific opinions, problem-solving using quantitative skills such as basic statistics, basic statistical interpretation, graphing from data, and understanding of research design elements and their influence on conclusions.

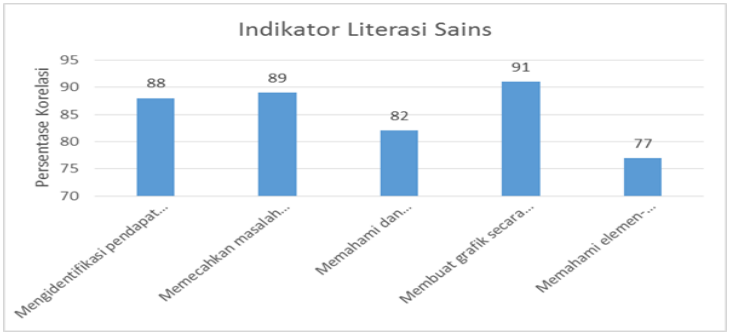

Figure 1. Percentage of Science Literacy Ability per indicator

From figure 1, it is known that the results of students' literacy skills in each indicator show different percentages. Four out of five indicators are in the very good category, while one indicator is in the good category. The indicator with the highest results (91%) was the skill of graphing from data, followed by problem solving using basic statistics (89%), identification of valid scientific opinions (88%), basic statistical interpretation (82%), and research design elements (77%). This result is consistent with Lestari's (2020) research, which shows that reading and charting skills score high, which is 80%. The assumption underlying this high skill is the ability of students to interpret data by creating graphs according to their usefulness. In addition,

students are already able to recognize appropriate graph formats and interpret quantitative data in science literacy (Silaban et al., 2022 ; Nasrun et al., 2023).

On the contrary, the understanding of research design elements received the lowest percentage (77%), although it was still relatively good. This result is better than previous research (Pratama et al., 2024) which recorded a value of 30% for this indicator. The assumption underlying this indicator getting a low percentage from other indicators is that students are still lacking in understanding the steps of research and abstract concepts in research that are not in accordance with the more concrete way of thinking of students so that students pay less attention to the scientific process that occurs in research activities. However, students still need the guidance of teachers to understand research results from other sources. Most students tend to memorize rather than understand the material, so it requires practice to analyze scientific phenomena.

Based on Table 1 above, the average score of students' scientific attitudes is 68, which is relatively low. This low scientific attitude is related to the lack of practicum activities in science learning, as stated by Yuliatin et al. (2021). The analysis shows that the average scientific attitude is 67.67%, which is relatively high. Cycles I and II in the research of Indriani et al. (2023) showed an increase from the good category (69.72%) to very good (85.83%). Scientific attitudes are important in forming individuals who are sensitive to the environment, have curiosity, and are able to solve problems.

Each indicator of scientific attitude shows different values. The indicator of perseverance attitude had the highest percentage (70.59%), followed by curiosity (70.11%), critical thinking (68.19%), open thinking (66.32%), and respect for data (63.16%). An attitude of perseverance can improve students' understanding and support the mastery of other scientific attitudes, such as curiosity (Sulistyo et al., 2023; Permana et al., 2021). In contrast, the attitude of respecting data has the lowest percentage. This shows that students still often mix facts with opinions without verifying information. The results of the correlation test showed a positive relationship between science literacy (x) and scientific attitude (y) with a correlation value of 0.496, which was quite strong. The higher the science literacy ability, the better the student's scientific attitude.

Based on the results of research conducted at SDN Ciracas 06, the science literacy ability of grade 5 students in science subjects showed a very good category, while the students' scientific attitudes were included in the good category. These findings reinforce the results of previous studies that state that science literacy plays an important role in building positive scientific attitudes among students. Research by Zuhrotul et al. (2023) found that science literacy skills correlated with scientific problem-solving and concept understanding. In addition, the Lestari (2020) study shows that students who are able to create and read graphs from data have a better level of science literacy. However, this study revealed that although science literacy indicators show excellent results, understanding of research design elements still needs improvement. This is in line with the research of Pratama et al. (2024), which states that students tend to memorize concepts without associating them with in-depth scientific analysis. The results of the research correlation showed a positive relationship between science literacy and scientific attitudes with a correlation value of 0.496. The higher the science literacy ability, the better the scientific attitude that students have. This strengthens the research of Safar et al. (2023) that the application of a contextual approach in science learning can improve both aspects.

Therefore, it is important for teachers to direct students to conduct scientific exploration and hands-on practice in order to be able to critically understand phenomena and cultivate a strong scientific attitude. Learning that involves experimentation and problem-solving is needed

to support the mastery of science literacy. Teachers play an important role in guiding students to have a positive scientific attitude from an early age, which can ultimately improve science literacy. The relationship between these two variables is influenced by learning experience, teaching methods, interests, and teacher support.

Conclusion

Research at SDN Ciracas 06 shows that the science literacy ability of grade 5 students in odd semester science subjects is in the very good category, while students' scientific attitudes are in the good category. There was a positive relationship between science literacy skills and scientific attitudes with the level of close relationship which was included in the medium category. The contribution of science literacy to the development of scientific attitudes was 24.6%. The implication is that the researcher hopes that this science literacy test instrument can be beneficial, especially for teachers and students. In the future, this instrument needs to be improved by including clear images, tables, and graphs so that it is easy to understand and read in the implementation of the exam. Based on the results of the research, the author provides several suggestions, (1) For teachers: Teachers should create an active classroom atmosphere and support meaningful learning experiences. They also need to apply the material in an interesting way so that students' science literacy and scientific attitudes can develop. (2) For Students: Students as future generations need to develop science literacy skills and scientific attitudes to compete in the technological era. They must get a learning atmosphere that can stimulate curiosity and critical thinking. (3) For the next researcher: The researcher can improve the question instruments and deepen knowledge to develop a scientific attitude. The next researchers can develop instruments by classifying samples according to certain categories such as age, gender or student learning outcomes. This research is expected to be the basis for further studies to obtain better and more accurate results.

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