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FACTORS INFLUENCING LOW SCIENCE LITERACY AND SCIENCE LEARNING OUTCOMES OF GRADE VIII STUDENTS OF SMP NEGERI 1 AEK KUO: AN ANALYSIS

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Abstract

This study analyzes the factors that influence the low scientific literacy and science learning outcomes of eighth-grade students of SMP Negeri 1 Aek Kuo. The scientific literacy skills of students in Indonesia are still very low based on PISA data, with Indonesia's average score always at the bottom. This study uses a quantitative descriptive method with a total sampling technique, involving 141 students from grades VIII-1 to VIII-5 of SMP Negeri 1 Aek Kuo. Data were collected through a questionnaire with 25 Likert-scale statements and analyzed using a percentage formula for each indicator. The results of the study identified five main factors that influence the low scientific literacy and science learning outcomes: misconceptions 77.29% (high), non-contextual learning 75.05% (moderate), selection of textbooks 62.23% (moderate), low reading ability 48.08% (low), learning environment and climate 45.08% (low). This study concludes that misconceptions and non-contextual learning are the main challenges that contribute to factors influencing low scientific literacy and science learning outcomes.

Keywords: scientific literacy, science learning outcomes, misconceptions, non-contextual learning

1. Introduction

Education is a crucial component of human life and a key foundation in preparing future generations to achieve the nation's ideals(Siregar, 2021). Education will continue to evolve over time in accordance with the demands of the times and the development of science and technology. Developments in education have entered the 21st century, with learning focused on students. According to(Syahidi *et al*., 2023), in facing the challenges of 21st-century development, scientific

literacy is crucial for students, particularly in science education. It enables students to understand, communicate, and apply scientific knowledge, fostering their potential and character for competitiveness in today's rapidly evolving world. Building scientific literacy in the current generation does not mean turning students into researchers; it is more about building scientific and technological knowledge to play a role in determining choices that impact current and future survival (Ramli *et al*., 2022).

Scientific literacy is a person's ability to apply their knowledge to identify questions, construct new knowledge, provide scientific explanations, draw conclusions based on scientific evidence, and develop a relativistic mindset so they can participate in addressing issues and ideas related to science (OECD in (Fuadi *et al*., 2020)). It is crucial to build scientific literacy in students as the next generation from an early age(Pratiwi *et al*., 2019). Building scientific literacy involves creating engaging learning conditions in science education that promote student activity. This approach develops critical thinking, responsible behavior, and character, which ultimately prepares students to address the challenges of modern society and contribute to the well-being of society (Jihan Fikriyyah *et al*., 2024).

Over the past 20 years since PISA released the results of students' scientific literacy abilities worldwide, the following data on student scientific literacy every three years, namely in 2000, 2003, 2006, 2009, 2012, 2015 and 2018, obtained average scores for Indonesia respectively: 393, 395, 393, 385, 375, 403, and 396. From the scores obtained every three years, Indonesia has always been at the bottom of the list, said to be the lowest level(Sukrisno *et al*., 2024). This low score in Indonesia is caused by several factors that influence scientific literacy and science learning outcomes. Another impact of low scientific literacy is that students are less responsive to problems and developments related to the surrounding environment, such as natural phenomena and local characteristics of the region(Safrizal, 2021).

According to (Randan *et al*., 2022) high student literacy skills are an indicator of educational success. With high literacy skills, students will be better at identifying a problem and drawing conclusions from the information they obtain related to the problems they face in life. In fact, the achievement of student science literacy in Indonesia has not met expectations, as shown by the results of the PISA international study, which ranked Indonesia 70th out of 78 participating countries.

The results of observations of students' scientific literacy at SMPN 1 Aek Kuo and interviews with science teachers, found that the school environment has held joint literacy activities every week, however, these activities only apply regular literacy not for scientific literacy. During the learning process, many students still have not applied scientific literacy. This is because the teaching and learning process has not emphasized the process of scientific literacy, then the learning process is more dominated by the teacher orteacher centered (Jufrida *et al*., 2020). This makes it difficult to understand scientific terms, so people feel bored and fed up, not focused on learning, not interested

and not enthusiastic, and even consider scientific literacy activities as unnecessary activities. Based on the description above, the researcher is interested in analyzing the extent to which factors influence scientific literacy and learning outcomes of students in science subjects. The aim is to determine the factors that influence low scientific literacy and science learning outcomes in class VIII of SMP Negeri 1 Aek Kuo.

2. Methods

This study uses a quantitative descriptive method, namely describing sample data using numerical data. The data collection technique is total sampling with a sample size of 141 students. The population of this study is all students in class VIII, while the research subjects are all students in class VIII-1 to VIII-5 which was carried out at SMP Negeri 1 Aek Kuo, North Labuhanbatu Regency, North Sumatra Province.

The research implementation procedure is divided into 3 stages, namely:

1. Preparation Stage, includes:
   (a) Conducting observations or observations of the school that will be used as the research location.
   (b) Compiling a grid of instruments for factors that influence scientific literacy and science learning outcomes.
   (c) Developing a research instrument in the form of a questionnaire on factors influencing scientific literacy and science learning outcomes.
   (d) Conduct questionnaire validation with expert validators
2. Level of Implementation, including:
   (a) Taking research samples from the classes used as research samples.
   (b) Conducting research data collection using a questionnaire sheet on factors that influence low scientific literacy and science learning outcomes of students.
3. Reporting Stage, includes:
   (a) Analyze the questionnaire data filled out by students.
   (b) Managing research data.
   (c) Reporting research data results.

In determining the factors that influence low scientific literacy and science learning outcomes of students, the instrument used in this study was a questionnaire sheet with 25 statements in the form of a Likert scale assessment, namely: score 4 (strongly agree), score 3 (agree), score 2 (disagree), and score 1 (strongly disagree).

The scores obtained by students after completing a test are raw data and must be processed into a standard score out of 100. This study used data analysis in the form of a questionnaire calculation analysis formula. The questionnaire analysis was carried out using the formula percentages(Purba, 2020) as follows:

$$P = \frac{f}{N} \text{ X } 100\ \%$$

Information :
P = Percentage of student responses
F = Frequency of students answering a choice
N = Number of samples
100 = Fixed number
Using the formula above, we obtain percentage data on factors influencing low scientific literacy and students' science learning outcomes. The percentage data will be interpreted based on the index of factors influencing low scientific literacy(Suryani, 2024) in Table 1. As follows:

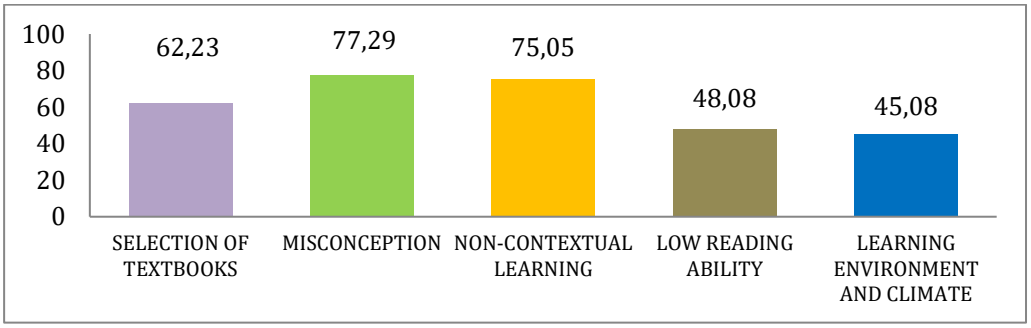
Table 1.
Category: Index of Factors Influencing Low Scientific Literacy

Percentage (%)	Category
76% ≤ 100%	High
51% ≤ 75%	Currently
26% ≤ 50%	Low
< 25%	Very Low

3. Result and Discussion

Based on the results obtained from the analysis of research data with indicator factors that cause low scientific literacy and science learning outcomes of students, the data results can be seen in the graph in Figure 1 below.

Figure 1
Graph of Research Results on Low Scientific Literacy and Learning Outcomes



From the graph above, the factors that influence the low scientific literacy and science learning outcomes of students at SMP Negeri 1 Aek Kuo can be seen in the following description; (1) Misconceptions have a percentage of 77.29% (high); (2) Non-contextual learning has a percentage of 75.05% (Currently); (3) Selection of textbooks has a percentage of 62.23% (Currently); (4) Low reading ability has a percentage of 48.08% (low); (5) Learning environment and climate has a percentage of 45.08% (low).

From the presentation of the results of the data analysis above, the analysis of factors that influence low scientific literacy and student learning outcomes is described as follows:

1. Misconceptions
In the first indicator, namely regarding misconceptions, the achievement of this percentage is quite high, as evidenced by the questionnaire with a score on misconceptions reaching 77.29% (high). This shows that students' wrong understanding of scientific concepts has an impact on low scientific literacy and overall science learning outcomes. This is in line with (Taufiq, 2012) that misconceptions are a major problem in science that requires serious handling because misconceptions are permanent when they are not proven wrong or do not get conflicted by other concepts.

This factor is caused by a lack of clear understanding of the material taught by the teacher, many Latin terms that are not understood by students, or the use of inappropriate learning resources. It is important to carry out appropriate interventions to identify and correct these misconceptions so that students can understand science concepts correctly.

2. Non-Contextual Learning
In the second indicator, namely non-contextual learning, the achievement of this percentage is proven by the questionnaire with a score for non-contextual learning reaching 75.05% (moderate). This states that students do not understand the material in depth which causes non-contextual

learning. In the analysis results, students experience difficulty in connecting theory with practice due to the dominant lecture learning method without discussion or practical experiments making students feel bored and less interested in scientific knowledge and difficulty relating scientific knowledge to everyday life. This demonstrates the need for a more contextual learning approach. Research(Multidisiplin, 2025) found that contextual learning not only increases students' understanding and interest in science but also helps them develop the skills necessary to apply scientific knowledge in everyday life.

Applied learning is essential to enhance students' understanding of scientific concepts applied in everyday life, such as changes in human skin color due to sun exposure. Teachers need to integrate experiments and practical activities into learning by utilizing real-life experiences as learning resources. Students can feel more empowered in applying the knowledge they gain in situations that are more understandable and useful(Riadi *et al*., 2022). With this approach, students' scientific literacy can be significantly strengthened, making science learning more relevant and useful in their social and environmental contexts.

3. Selection of Textbooks

The third indicator, textbook selection, is a contributing factor to low scientific literacy and student learning outcomes. This percentage achievement is evident in the questionnaire, with a score of 62.23% (moderate), indicating that students tend to have relatively good access to relevant learning resources. Research (Fuadi *et al*., 2020) found that science learning in scientific literacy is largely limited to textbooks or texts rather than direct learning.

These percentage results indicate that students can choose textbooks that meet their needs. However, it's important to reiterate that textbook quality must also be evaluated to ensure that the material presented supports a sound and correct understanding of science concepts.

4. Low Reading Ability

The fourth indicator, low reading ability, can impact students' scientific literacy and science learning. This is in line with research conducted in 2016 by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), which found that reading habits in Indonesia are very low in 61 countries. The study, published under the title "The World's Most Literate Nations," ranked Indonesia 60th (kompas.com, 2019).

However, the achievement of research results is proven by the questionnaire with a score percentage of 48.08% (low). This percentage indicates that low reading ability is a factor influencing low scientific literacy scores. In the researcher's analysis, students were able to evaluate scientific literacy texts. The success in this percentage is due to the school's implementation of the literacy movement. However, intervention programs are needed to improve students' reading skills, such as reading training and the use of more effective teaching methods.

In line with research (Filiz *et al*., 2024) instructional intervention programs significantly impacted the reading abilities of students with scientific literacy difficulties, with comprehension strategy

instruction being more effective than other methods. Organizing targeted interventions is crucial for improving reading skills in students facing scientific literacy challenges.

5. Learning Environment and Climate

In the fifth indicator, namely the learning environment and climate, in this indicator the percentage score obtained is 45.08% (low), which means that the learning environment and climate show that this factor supports students' scientific literacy and includes various factors that influence the educational process, including interactions between teachers and students and the emotional atmosphere at school.

The analysis revealed that a conducive learning environment, creating a positive learning climate, is crucial for supporting students' academic and social development. The state of school infrastructure, human resources, and the type of school organization and management significantly influence student literacy achievement (Fuadi *et al*., 2020). Students learn in a supportive environment, with adequate facilities and positive social interactions.

(Susanto & Anggresta., 2024) stated that a supportive learning environment will make students feel valued and maximally motivated, thereby increasing their desire to learn and providing a positive learning environment. A positive learning environment can increase students' motivation and concentration in scientific literacy learning.

Based on the results of the data above, it indicates that the percentage of students at SMP Negeri 1 Aek Kuo has good scientific literacy skills. Misconceptions and non-conceptual learning are the main challenges that influence low scientific literacy and science learning outcomes for students. In science learning, the main problem that has not yet been fully resolved is the perception among students that this subject is difficult to understand and comprehend (Suparya *et al*., 2022). Therefore, it is difficult for students to understand scientific concepts and relate scientific knowledge to everyday life.

4. Conclusion

The results of the study showed that students' understanding of science concepts was high, as evidenced by the results of the questionnaire percentage analysis that misconceptions and non-contextual learning were the main factors influencing low scientific literacy and student learning outcomes. Meanwhile, in textbook selection, low reading ability and learning environment and climate had a low percentage of factors influencing low scientific literacy and science learning outcomes at SMP Negeri 1 Aek Kuo, with percentage scores on (1) Misconceptions having a percentage of 77.29% (high); (2) Non-contextual learning having a percentage of 75.05% (Currently); (3) Textbook selection having a percentage of 62.23% (Currently); (4) low reading ability having a percentage of 48.08% (low); (5) Learning environment and climate having a percentage of 45.08% (low). The need for students' understanding of scientific concepts and

scientific knowledge. In addition, the quality of book texts needs to be considered to support a good understanding of scientific concepts. On the other hand, low reading skills and learning environment and climate need to be considered to improve students' scientific literacy skills and learning outcomes.

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