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# Analysis of Students' Scientific Literacy Abilities on Science Learning in High School

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**Abstract.** The world of education plays an important role in civilization and the mobility of future generations. However, there are still weaknesses in the learning process, especially in methods that are monotonous and rely on memorization, which results in students having difficulty relating learning to real contexts. Science learning in schools emphasizes results, while the process is often neglected. Scientific literacy, which includes content, context, competencies and attitudes, is the focus of this research to improve students' scientific literacy abilities at the high school level. Data from the Program for International Students Assessment (PISA) shows that scientific literacy in Indonesia is still low. This research aims to analyze students' scientific literacy profiles. Data collection was carried out through scientific literacy questions that were validated constructively and empirically. The scientific literacy indicators measured include 1) Identifying valid scientific opinions; 2) Understanding of research design elements and their influence on findings; 3) Ability to complete tests or questions related to scientific phenomena; 4) Understanding and interpreting basic statistics; 5) Ability to draw conclusions, observe and make decisions based on data. Students' scientific literacy abilities are divided into very good, good, sufficient and poor categories. Based on the research results, it was found that the percentage of students in the very good category was 27.08%, in the good category was 31.25%, in the fair category was 36.45%, and in the low category was 5.20%. Based on these results, it can be concluded that the highest percentage describing students' scientific literacy abilities is at sufficient criteria. Therefore, it is important to increase students' scientific literacy.

**Keywords:** literacy ability, science literacy, science

## INTRODUCTION

The transition period from the industrial revolution 4.0 to 5.0 has an important impact on the progress of human resources, especially in supporting the education sector. Today, in the world of education, 21st century skills play an important role in facilitating students' understanding of science materials. Science learning itself includes aspects of products, attitudes, processes, and applications (Fatimah et al., 2021). In applying scientific knowledge to daily life, the orientation of sustainability is something that needs to be emphasized.

To achieve the desired learning outcomes, science learning requires students to have good science literacy skills. Science literacy has a very important role in the world of education, as evidenced by the assessment of science literacy as an indicator of student learning outcomes (Rita Zahara et al., 2022). However, the reality is that the science literacy ability of Indonesian students is still low, as evidenced by the results of the PISA survey from 2000 to 2018 which shows that the achievement of science literacy of Indonesian students is still at a low

level. Science literacy, according to the Programme for International Student Assessment (PISA), consists of four interrelated aspects, namely content aspects, context, competence, and science attitudes. The results of the 2018 Program for International Student Assessment (PISA) show that the science literacy of Indonesian students is still ranked 73rd with a score of 371, while the average science literacy ability of OECD countries is 487 out of a total of 78 participating countries. This fact shows that the science literacy ability of Indonesian students is below average. Thus, the ability of Indonesian students to understand the concepts and processes of science is still relatively low, and they are not fully able to apply the scientific knowledge that has been learned in daily life, according to reports from the OECD in 2016 and 2019.

Science literacy is also included in science learning. In schools, students still do not fully have good literacy skills. Science learning in schools is expected to be able to apply or implement science literacy in learning. Science is essentially a product, process, attitude and technology. So that in science learning, it is impossible for students to only acquire knowledge (products) but students must be actively involved in learning such as finding knowledge, proving that knowledge through a practicum or experiment and concluding it and ultimately being able to create a tool or technology that can later solve problems faced by the community (Suparya, et al., 2022).

Seeing the importance of scientific literacy in science learning, it is necessary to carry out an analysis to see students' literacy abilities. By knowing their situation, we as educators can look for and implement several alternative solutions as an effort to improve the learning process which prioritizes the development of students' scientific literacy abilities.

## IMPLEMENTATION METHOD

This research was conducted at SMA Negeri 2 Bireuen in the odd semester of the 2024/2025 academic year, with 96 students from class XI as a sample. The sample selection used the convenience sampling method, which was chosen because the research was carried out in classes determined by the school. Thus, researchers conducted research in classes that were already available. This research is experimental research, where researchers give treatment to the sample to measure scientific literacy abilities after the treatment. The treatment given is the presentation of questions that are in accordance with scientific literacy indicators. The type of experimental research used is quasi-experiment with a quantitative approach. Data was obtained through a scientific literacy ability test instrument, which consisted of questions related to science learning at the high school level. These questions are designed to measure aspects of students' scientific literacy as a whole.

## RESULTS AND DISCUSSION

The results of this study refer to the science literacy ability scores of students that have been calculated. From these calculations, the data was included in the criteria for science literacy ability. There are several criteria for science literacy as seen in table 1.

**Table 1. Science literacy criteria**

| Score | Criterion |
|---|---|
| 86 – 100 | Excellent |
| 72 – 85 | Good |
| 58 – 71 | Enough |
| 43 – 57 | Low |
| ≤ 43 | Very Low |

The research results obtained are presented in the form of percentages based on categories in table 1. The results are presented in table 2.

**Table 2. Percentage of science literacy criteria**

| Category | Number of students | Percentage |
|---|---|---|
| Excellent | 26 | 27,08% |
| Good | 30 | 31,25% |
| Enough | 35 | 36,45% |
| Low | 5 | 5,20% |

From the presentation in table 2 regarding the science literacy criteria, it can be seen that there are 26 students in the very good category, with a percentage of 27.08%, then in the good category as many as 30 students with a percentage of 31.25%, the category is enough to be filled by 35 students with a percentage of 36.45%, and then in the low category consists of 5 students with a percentage of 5.20%.

Based on the results of the mapping of science literacy criteria, the category that appears the most is the sufficient criterion, with a percentage of 36.45%, this is in line with research conducted by (Pratama et al., 2024), this shows that students are still on the sufficient criteria in their science literacy, so that there are several students who are also included in the very good criteria, good, and low.

Based on the results of the research reviewed from each indicator, it can be seen in figure 1.

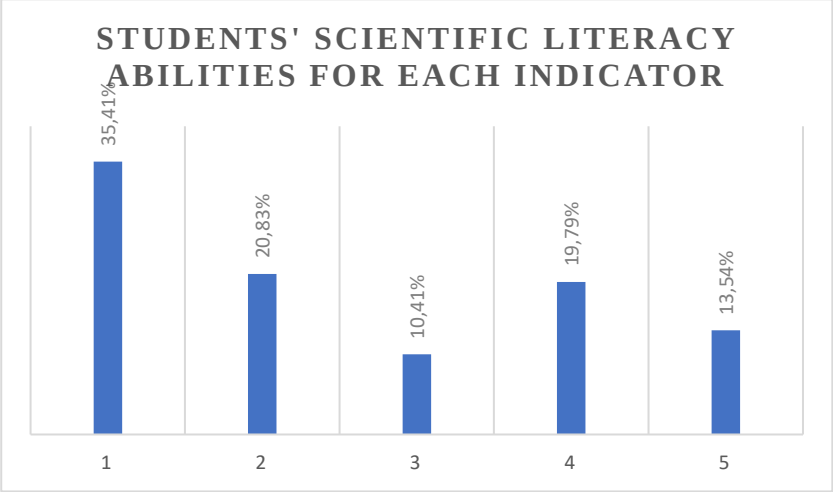


**Figure 1. Results of Analysis of Students' Scientific Literacy for Each Indicator**

The information in figure 1 includes: 1) Identifying valid scientific opinions; 2) An understanding of the design elements of the research and their influence on the findings; 3) Ability to complete tests or questions related to scientific phenomena; 4) Basic statistical understanding and interpretation; 5) Ability to draw conclusions, observe, and make decisions based on data.

Based on the graph in figure 1, the indicator that shows the ability to identify valid scientific opinions has a percentage of 35.41%, making it the highest achievement. This high percentage is likely due to the efforts of teachers who emphasize the importance of literacy in the learning process, thereby encouraging student engagement. This research is in line with (Inggrid Ayu Amala & Yushardi, 2022) showing that science literacy skills, especially in identifying valid scientific opinions, tend to be poor because students are late in understanding the concepts taught by teachers or other learning resources when answering questions.

The next indicator was an understanding of the design elements of the study and their influence on the findings, which showed a percentage of 20.83%. Therefore, students need guidance from teachers to be able to practice this ability by understanding data from reliable sources, which will help improve their literacy and deepen their understanding.

The next indicator regarding the ability to complete tests or questions related to scientific phenomena showed a percentage of 10.41%. This percentage reflects the lack of practice that students do to improve their understanding of science materials or concepts related to natural phenomena of everyday occurrences.
The next indicator, namely basic statistical understanding and interpretation, showed a percentage of 19.79%. This number shows the need for students to practice in understanding and interpreting the data provided by the teacher. Therefore, teachers must guide students in mapping their understanding and assist in interpreting the data, which can ultimately improve students' science literacy skills.

The last indicator is the ability to draw conclusions, observe, and make decisions based on data with a percentage of 13.54%. Science literacy includes the ability to make decisions that are expected to be based on students based on the science or concepts they have, the form of high thinking of students is through reasoning.

## CONCLUSION

Based on the results and discussion above, it can be concluded that most students' scientific literacy abilities are in the sufficient category, namely 36.45%, with the highest indicator being the ability to identify valid scientific opinions, which reached 35.41%. Therefore, it is important to improve students' scientific literacy skills by prioritizing learning that uses scientific literacy-based questions.

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