
ANALYSIS OF STUDENTS' SCIENCE LITERACY SKILLS ON THE CIRCULATORY SYSTEM MATERIAL AT SMA NEGERI 1 LUWUK

Moh. Fahri Haruna¹, Abd. Muin Kenta², Nurlia³,

Sulasmi Anggo⁴, Reina Novrianti S Bungaji⁵

Universitas Muhammadiyah Luwuk, Sulawesi Tengah, Indonesia

moh.fahriharuna@gmail.com¹, muinkenta@yahoo.com², nurlia2811@gmail.com³,

sulasmianggo27@gmail.com⁴, reinanovrianti@gmail.com⁵

ABSTRACT

Science literacy is an ability that involves various aspects, including knowledge (concepts, facts, and vocabulary), processing skills (thinking and intellectual skills), dispositions (behaviors and attitudes), and the ability to connect them with the reality around us. Effective education is essential to improve the quality of human resources in the era of rapid development of science and technology. This study evaluates students' science literacy skills on circulatory system material at SMA Negeri 1 Luwuk. This study used a descriptive qualitative research method. The sample consisted of 68 students selected from the population of class XI IPA students at SMA Negeri 1 Luwuk in the 2022/2023 school year. The data collection technique used a science literacy test consisting of 27 questions. Data were analyzed using descriptive statistical analysis techniques. The results showed that overall, students' science literacy skills in circulatory system material were in the poor category. This evaluation is based on four indicators of science literacy with the following percentage results: nominal indicator 37.68% (poor), functional indicator 14.91% (abysmal), and conceptual indicator 13.80% (abysmal). The implication of this study is the need for improved teaching methods and the use of more effective learning media to improve students' science literacy. The findings can be used for curriculum improvement and school teaching strategies.

Keywords: Science Literacy, Blood Circulatory System, Student.

Corresponding Author: Moh. Fahri Haruna

E-mail: moh.fahriharuna@gmail.com



INTRODUCTION

Education has a very significant role in improving the quality and ability of individuals (HR); education is necessary for humans to be included in science, especially today (Suryana & Iskandar, 2022). The world is increasingly developing in all fields, including economics, culture, science, and technology. Of course, this development must be connected to the critical role of education. As stated (N.Sari, 2021), the development of science and technology (IPTEK, *Ilmu Pengetahuan dan Teknologi*) has influenced the development of the world of education in Indonesia. Indonesia's education sector is also growing to improve the business world.

Of course, innovations continue to emerge with education development in Indonesia. Innovations will emerge every day, bringing changes and developments to human behavior. This inevitable development requires the preparation of adequate human resources to compete in the current era of science and technology (Lase, 2019). The rapid development and continuous progress in the field of science and technology create demands for individuals to be able to adapt to changes in current knowledge.

Science literacy uses scientific data and evidence to assess the quality of information and arguments in science. It is related to the knowledge, understanding, skills, and values that exist in science. Students are expected to have skills and be able to apply science in everyday life (Taofiq et al., 2018). Literacy is a complex process that involves the development of prior knowledge, cultural influences, and individual experiences to create deeper understanding and new knowledge (Abidin et al., 2021).

The circulatory system is a movement mechanism in the body that plays a role in carrying various substances. In addition, the critical role of the circulatory system in humans involves the process of circulating oxygen from the lungs to all parts of the body and removing carbon dioxide from the body to the lungs for excretion, transporting hormones, supporting the immune system, transporting nutrients needed by the body, and regulating body temperature (Tresnaasih, 2020).

Teaching about the human circulatory system is important because it involves understanding the circulatory organs in the human body and the very complex process of blood circulation. Therefore, creative learning media must be used to help students understand the material (Jumrodah et al., 2015). According to previous research, the problem solving model is a method to improve students' abilities involving a scientific process that involves evaluation, analysis of understanding of achievements. In the context of problem-solving learning, students are taught to search and validate (Ariyani & Prasetyo, 2021).

This study aims to evaluate students' science literacy skills on circulatory system material at SMA Negeri 1 Luwuk to improve their science literacy. This research will contribute to enriching learning methods in the field of science and help students better understand and apply knowledge about the circulatory system in everyday life. In addition, this research is expected to encourage teachers to be more creative in delivering material so that the teaching and learning process becomes more interesting and effective.

METHOD

The study used a qualitative descriptive approach to describe students' science literacy skills at SMAN 1 Luwuk in Biology, especially when studying the Blood Circulation System material. The data obtained was collected through questions to students in the form of tests, with the expectation that researchers can produce accurate data and describe the actual situation according to the information obtained to achieve the study objectives.

This research was conducted on May 26 - June 26, 2023, at SMA Negeri 1 Luwuk. It took the entire population of students in class XI IPA at SMA Negeri 1 Luwuk in the 2022/2023 school year, totaling 212. The sample is part of the total research population of 68 students, obtained using the Solvin formula with a value of $e = 10\%$ (0.1).

RESULTS AND DISCUSSION

This study aimed to evaluate the science literacy skills of students of SMA Negeri 1 Luwuk. This study was conducted in June 2023 and involved class XI IPA 2, XI IPA 5, and XI IPA 6 students at SMA Negeri 1 Luwuk. The number of students from the three classes was 68, and they were taken as samples in this study. The science literacy test consisted of 27 questions covering material about the circulatory system they had observed before.

The research on students' science literacy skills at SMA Negeri 1 Luwuk was then analyzed based on four indicators with 27 questions. The results of this evaluation are presented in the illustrations provided.

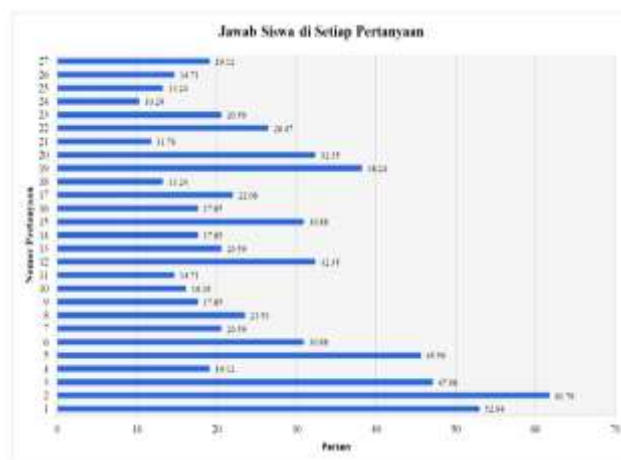


Figure 1. Students' Answers on Each Question

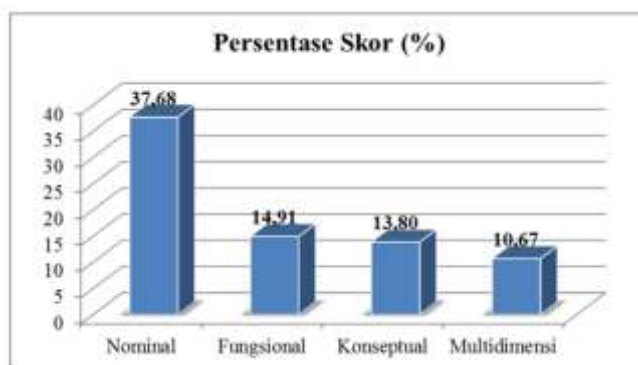


Figure 2. Diagram of Achievement of Each Science Literacy Indicator

Table 1. Results of Achievement Categories of Each Science Literacy Indicator

No.	Science Literacy Indicator	Question Number	Percentage (%)	Category
1.	Nominal	1-8	37,68	Bad
2.	Functional	9-19	14,91	Very Bad
3.	Conceptual	20-24	13,80	Very Bad
4.	Multidimensional	25-27	10,67	Very Bad
Overall Indicator		1-27	20,98	Bad

Based on the calculation of student answers, many correct answers were given to question number 2. So, in question number 2, the question is about the part of the blood component that detects foreign objects and plays a role in the immune system. The correct answer is "White blood cells". From the calculation results, the percentage of students who answered question number 2 correctly was 61.76%, the highest percentage compared to other questions. This means that most students can identify that white blood cells are part of the blood that detect foreign substances and play a role in the immune system.

Understanding that white blood cells are a vital element in our immune defense is essential. They are responsible for fighting infections and protecting the body from disease. Students' ability to answer this question demonstrates their understanding of the function and role of white blood cells in maintaining a healthy body.

Reasoning is the culminating form of student thinking (Kusairi, 2012). In science literacy, decision-making is based on an individual's reasoning based on knowledge and concepts. In a more straightforward context, reasoning refers to the process by which a person uses knowledge acquired in school to conclude (Indrawati, 2018) explains that critical thinking skills in understanding concepts include comparing, identifying, classifying, providing examples, applying, and drawing conclusions from a concept.

So, in question 24, the question is, "If in a person's blood there is agglutinin B and Anglutinin A, the person has a blood type." The correct answer is "B." From the calculation results, only 10.29% of students answered question 24 correctly, the lowest percentage compared to other questions. This indicates that most students must fully understand the material about blood groups and their relationship with agglutinogens and agglutinins.

It is essential to understand that the presence or absence of agglutinogens and agglutinins in the blood determines blood type. For example, if someone has agglutinin B and Anglutinin A, then their blood type is B.

According to (Priyantini et al., 2015) having scientific understanding is a significant aspect in shaping individuals with a level of science literacy. They can apply basic scientific principles in solving everyday problems and in the decision-making process, both personal and those that impact society.

Science literacy focuses on helping students acquire the knowledge to apply science concepts with a deep understanding and encourages them to think critically. In addition, science literacy also teaches students how to make balanced and appropriate decisions when facing relevant issues in their lives, as described by Pratiwi et al. (2019).

The nominal indicator data shows that the poor category has a student percentage of 37.68%. This means that around 37% of students need help recognizing the concepts in the questions. Students' nominal literacy in this study was measured through students' ability to identify concepts correctly. This finding indicates that some students are less enthusiastic about understanding a material concept. Given its significance, this result should be a primary concern for educators, especially at SMA Negeri 1 Luwuk, to increase students' interest in material concepts. The same findings (Wijayanti, 2016) noted that student interest in understanding a concept significantly correlates with student learning achievement.

Functional literacy in this indicator shows a percentage of 14.91%, which is included in the inferior category. This result illustrates that around 14% of students need help recognizing and understanding functions and related concepts. As mentioned by (Soobard Rannikmae, 2011), students cannot identify the relationships between related concepts in this phase. This result warns educators that functional science literacy is essential for a more profound understanding and needs improvement. In addition, changes in learning models also need to be considered by educators because improving students' understanding of concepts cannot be achieved through memorization or lecture methods alone.

The data shows that the literacy level in conceptual indicators is still shallow, reaching only 13.80%. This falls into the deficient category. In this context, of the 68 students who took the science literacy test, the average could only answer less than two questions correctly. This indicates that about 13% of students had difficulty understanding the related cause-and-effect relationships and concepts. Students are expected to have the skills to analyze and solve problems involving quite complex data at this stage. If conceptual literacy understanding still needs to be stronger, this could

be due to a lack of functional literacy understanding. Therefore, it is necessary to apply problem-solving-focused learning methods so that students can practice facing and solving problems with a higher level of complexity.

Multidimensional literacy is the most complex form of literacy. The results showed that only about 10.67% of the student's answers were correct, which is still in the deficient category. Previous information covering nominal literacy to conceptual literacy also showed unsatisfactory results. Therefore, it is not surprising that the results of multidimensional literacy are also low. These findings have little in common with previous science literacy researchers, such as those conducted by (Celik, 2014). The study results show that nominal and functional literacy skills must still be adequate. In contrast, conceptual and multidimensional literacy skills have meager and disappointing results.

According to (K. Sari & Nurwahyunani, 2016), students' lack of science literacy skills is caused by several factors. First, science learning contributes little to student success because it is often isolated from the social context. Second, science learning tends to focus on mastering the material only. Third, the use of inappropriate assessments causes students to only be prepared to memorize information. Fourth, reading activities are also influential.

In addition, other factors that influence students' science literacy skills are school facilities and infrastructure. According to (Al-Naqbi Tairab, 2006), facilities such as laboratories are important in science learning because they help learners develop their cognitive understanding through practical experiments. The same thing was found in research (Agastya, 2017), which showed that school facilities, including laboratories, support the science learning process and efforts to improve students' science literacy.

Based on the results of the study, it is stated that the ability of science literacy on virus material during the COVID-19 pandemic at SMAN 3 Luwuk is considered sufficient, but this shows that students' literacy still needs to reach an optimal level. However, this study rated students' science literacy skills poorly—one contributing factor needed to be a more interactive learning approach. Limitations also influence the low achievement of Indonesian students' science literacy in integrating science processes, as mentioned by (Asteno Muzuni, 2023).

A study by (Jamaluddin, 2018) found that it is essential for educators to have science literacy skills. Teachers' science literacy skills can have a positive effect on students' science literacy skills. By addressing these issues, students' science literacy in the context of circulatory system material is expected to improve.

The material on the circulatory system is an abstract yet essential concept in everyday life. Too often, school learning focuses on memorization without deeply understanding the concepts. Therefore, it is essential to emphasize science literacy in the material about the circulatory system. Science literacy helps students to understand the concept better and relate it to real situations in daily life. Teachers can provide daily challenges or problems related to the circulatory system. For example, students can be asked to find out how physical activity affects blood circulation or how a healthy diet can affect the circulatory system's health.

Students' lack of interest in reading and their habit of rarely answering questions in discourse, graphs, and images are significant findings that should be considered in designing the curriculum. The findings also emphasize the need for appropriate instructional strategies to improve science literacy, in line with the suggestions made by (Schwartz et al., 2006). Meanwhile, the mastery of science shows that science literacy is still low, with percentages below 50% for all categories, as

reported by (Rusilowati et al., 2016). These findings highlight the importance of efforts to improve science literacy among students.

Based on the data provided, it can be seen that the overall science literacy skills of SMA Negeri 1 Luwuk students are still in the poor category at 20.98%. This shows that students' science literacy skills could be more optimal than expected. Several additional steps need to be taken to improve science literacy skills at SMAN 1 Luwuk. First, schools need to strengthen the curriculum that emphasizes developing science literacy skills, including concept understanding, application in daily life, and problem-solving. A curriculum integrated with real-world contexts and prioritizes concept understanding will help students improve their science literacy.

CONCLUSION

Based on the research and discussion results, the four indicators measured, nominal, functional, conceptual, and multidimensional, all show unsatisfactory categories. Nominal literacy has a percentage value in the poor category of 37.68%, functional literacy in the poor category of 14.91%, conceptual literacy in the poor category of 13.80%, and multidimensional literacy in the poor category of 10.67%. The overall percentage results show that the science literacy skills of SMA Negeri 1 Luwuk students related to circulatory system material are in the poor category, with a percentage value of 20.98%.

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