

## Analysis of science literacy skills of students of the Biology Education Study Program, Labuhanbatu University

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### Abstract

Science literacy skills are a person's ability to apply scientific knowledge to real-world situations. This study aims to analyze students' science literacy skills. This research uses a qualitative descriptive method that aims to describe carefully and systematically the facts and nature of a particular population. The sample in this study was 56 students of Biology Education, Faculty of Teacher Training and Education, University of Labuhanbatu. The sampling technique uses purposive sampling. Data collection techniques in the form of essay tests and questionnaires. Data analysis techniques using the Miles and Huberman Model. The results of the study showed that the science literacy ability of students of the Biology Education Study Program was still classified as "low". The highest science literacy ability was in the content aspect of 35.71% while for the lowest test results in the attitude aspect of 3.57%. The low ability of science literacy students of the Biology Education Study Program at Labuhanbatu University, so that efforts are made to improve, especially in aspects of attitudes that are still unsatisfactory by structuring the scope of the material provided and the lecture process carried out, choosing the right and interesting media/learning model so that the atmosphere in the lecture process becomes more effective.

### Abstrak

Kemampuan literasi sains merupakan kemampuan seseorang untuk menerapkan pengetahuan ilmiah pada situasi dunia nyata. Penelitian ini bertujuan untuk menganalisis kemampuan literasi sains mahasiswa. Penelitian ini menggunakan metode deskriptif kualitatif yang bertujuan menggambarkan secara cermat dan sistematis mengenai fakta dan sifat populasi tertentu. Sampel dalam penelitian ini mahasiswa Pendidikan Biologi, Fakultas Keguruan dan Ilmu Pendidikan, Universitas Labuhanbatu yang berjumlah 56 mahasiswa. Teknik pengambilan sampel menggunakan *purposive sampling*. Teknik pengumpulan data berupa tes essay dan kuesioner. Teknik analisis data menggunakan Model Miles dan Huberman. Hasil dari penelitian menunjukkan bahwa kemampuan literasi sains mahasiswa Program Studi Pendidikan biologi masih tergolong "rendah". Kemampuan literasi sains yang tertinggi yaitu pada aspek konten 35,71% sedangkan untuk hasil tes terendah pada aspek sikap yaitu 3,57%. Rendahnya kemampuan literasi sains mahasiswa Program Studi Pendidikan Biologi Universitas Labuhanbatu, agar dilakukan upaya untuk peningkatan terutama pada aspek sikap yang masih belum memuaskan dengan cara melalui penataan ruang lingkup materi yang diberikan serta proses perkuliahan yang dilakukan, memilih media/model pembelajaran yang tepat dan menarik agar suasana dalam proses perkuliahan menjadi lebih efektif.

## A. Introduction,

Education is a process by which learners become productive, innovative, creative, independent and successful members of society (Fadlika et al., 2020). Learning science can help students deal with various challenges in the complicated modern world. A person using a good foundation of scientific knowledge is a critical thinker, sensitive to the environment and accustomed to using scientific knowledge to solve problems around him. Therefore, the cultivation of science literacy through science learning does not only end until learners understand the theory, legal or cognitive skills, but must also achieve goals in scientific processes, products, and behaviors (Dewantari & Singgih, 2020).

On the other hand, it defines science literacy as a person's ability to apply scientific knowledge in concrete world situations. Students play a central role in classroom learning (OECD, 2019). The low level of science literacy among students may be caused by the low level of science literacy among teachers and the inability of teachers to apply approaches in science education (Aragão et al., 2018).

Based on data from The Programme for International Student Assessment (PISA) published by OECD (2019), Indonesian students have a science literacy score of 396, much lower than the OECD average of 489, which is still quite low. Globally, Indonesian education requires special measures in pedagogical models and school systems to improve students' science literacy (Safrizal et al., 2020). One of the challenges that will be faced in this 21st century challenge is science literacy or in "melek sains" (*science literacy*) (Irwan et al., 2020).

Science literacy is something that students expect at this time considering the times, and now in the 21st century the era of science and technology is reverberating throughout the world, indicating that this science literacy must be reflected and immediately proclaimed to students to keep up with the times. The Ministry of Education and Culture in the 2020 Strategic Plan (Renstra) targets that in the upcoming PISA 2024 test will be with a reading score of 396, science 402, and mathematics 388 (Kusumayanti, 2021).

The teacher's academic reading skills give a good impression to what will happen to student learning. therefore, a teacher is a candidate who must want to help students develop their science literacy (Sumanik et al., 2021). Based on initial observations, it was found that the science literacy ability of students of the Biology Education Study Program at Labuhanbatu University was still low

due to lack of learning motivation, reading materials related to biology, lack of tools and materials provided in the laboratory.

According to Lestari (2018), this results in low student software skills, poor understanding of science concepts, and most students are very good at memorizing but less smart in applying what they learn. This may be due to students' tendency to use rote memorization to understand scientific concepts rather than reasoning skills.

It is feared that the lack of science literacy skills of students of the biology education study program will cause misconceptions with students that damage the quality and success of learning and come from the aspects of knowledge (cognitive), attitudes and values (affective), and skills (psychomotor). In accordance with that, the purpose of this study is to analyze the extent of science literacy of students of Biology Education Study Program of Labuhanbatu University.

## B. Material and Method

This type of research is qualitative descriptive research that aims to describe carefully and systematically the facts and nature of a particular population. This study aims to analyze a state and ability of science literacy in students of the biology education study program in Semester III and V of the 2022/2023 academic year of Labuhanbatu University. The samples in this study were taken from 2 classes from semester III and V totaling 56 people. Semester III amounted to 34 students and semester V amounted to 22 students. The aspects and indicators of science literacy ability are arranged as Table 1.

Data collection techniques in the form of science literacy tests in the form of essay tests and questionnaires. Questionnaires are used to determine what factors and efforts affect student science literacy that can be used to develop student science literacy.

Each student's answer is grouped and percentaged to see the level of science literacy based on 5 existing aspects. The 5 aspects consist of context aspects, content aspects, competency /process aspects, attitude aspects, and knowledge aspects. Each student's answer is grouped and percentaged to see the level of science literacy based on the five aspects.

Miles & Huberman (1984), suggests that activities in qualitative data analysis are carried out interactively and take place continuously, so that the data is saturated. The stages in data analysis are data reduction, data display, and conclusion drawing/verivication (Sugiono (2017).

**Table 1 Student Literacy Aspects and Indicators**

No	Aspects	Indicators
1.	Context	1) Health 2) Natural resources
2.	Content	3) Humans 4) Ecosystems 5) Cells
3.	Competency/Process	6) Identify scientific problems 7) Explain phenomena scientifically
4.	Attitude	8) Support scientific inquiry (Understand the importance of considering different scientific perspectives and scientific argumentation) 9) Confidence as a science learner
5.	Knowledge	10) Interest in science 11) Scientific investigation

(Source: Modified from Maulida, 2021)

### C. Results and Discussion

The initial stage of the research was the preparation of a science literacy ability test and the use of modified indicators from Maulida (2021). The students' Science Literacy Proficiency for each indicator as a whole is shown in Figure 1.

The results of the student science literacy ability test showed that the highest science literacy test results were in the content aspect of 35.71% while the lowest test results in the attitude aspect were 3.57%. It can be seen from figure 1, the graph shows that most of the science literacy skills of students in the Biology Education Study Program of Labuhanbatu University are still relatively low, with an average of 17.10% for semester III and 22% for semester V which means that it is still below 50% included in the low category.

#### Context Aspects

Context aspects there are several scopes of science application fields in personal, social and global settings, namely: (1) Health; (2) natural resources;

(3) environmental quality; (4) danger; (5) the latest developments in science and technology (Lestari, 2018). To find out the context aspects that exist in science literacy skills, researchers use student questionnaires and written tests in the form of essay questions. The indicators of context aspects used are the field of health and the origin of natural resources. from the results of the research obtained in health indicators of 26.78% (III) and 32.14% (V), natural resource indicators of 33.92% (III) and 21.42% (V), which of course are still classified as low category.

The results of Lestari's research (2018), it is also seen that what will happen as long as the context aspect receives a homogeneous percentage of 23% using the category less once. This shows that students have not been able to identify valid scientific opinions. The total percentages provide that students of biology education have not been able to identify valid scientific opinions. Meanwhile, students are required to identify an opinion according to the evidence that has been found.

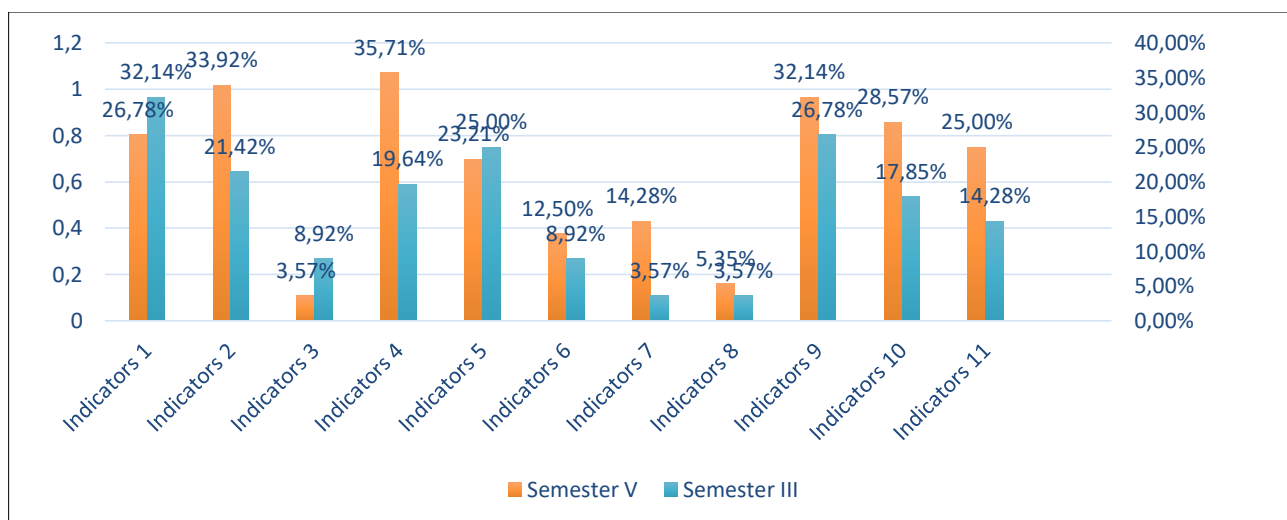


Figure 1 Student answer results on the science literacy ability test

## **Content Aspect**

According to Vashti et al. (2020), content knowledge refers to theories and concepts applied to understand a phenomenon. Wulandari, 2016 and Lestari, 2018 in this case, the relationship with competence to identify scientific questions is closely related to a person's ability to apply his content knowledge to identify a problem.

From the results of the study produced human indicators of 3.57% (III) and 8.92% (V), ecosystem indicators of 35.71% (III) and 19.64 (V), and cell indicators of 23.21% (III) and 25.00% (V), which of course are all still classified as low categories. Although in the content aspect, the percentage is higher than other aspects, it still does not make the value of student literacy skills in the content aspect fall into the high category, because all are still <50%.

Research Lestari (2018), received percentage results on the aspect of content received homogeneous percentage of 37% using categories less once. In the research of, Sumanik et al. (2021), it can be concluded that students' science literacy skills aspects of content knowledge are medium (N-gain 0.37).

As a result of this research is also supported by previous studies Febriyanti et al. (2021), Where students' conceptual knowledge is greater than the ability to apply scientific knowledge, identifying articles to form higher content information comes from procedural and epistemic knowledge. Sutrisna (2021), states that repeating lessons through reading is necessary to enhance understanding and comprehension as a result they can relate the new knowledge they have gained to what they had before. Fuadi et al. (2020) In addition, students must get used to working on analytical questions for science literacy that demand to develop their thinking skills if they want to increase content knowledge in problem identification.

If students cannot use their prior knowledge to identify problems, they will have difficulty combining the new information they receive with the original information they received earlier (Novitasari, 2018). The results of the questionnaire also revealed that students during the learning process, the focus is not always on paying attention to lecturers, but there are times when students are engrossed in themselves, daydreaming, playing gadgets and even chatting with their friends.

## **Competency/Process Aspects**

The results showed indicators identifying scientific problems by 12.50% (III) and 8.92% (V) and ecosystem indicators by 14.28% (III) and 3.57% (V). According to Rini et al. (2021), aspects of

competence or science processes include processes involved in answering questions or solving problems, such as identifying problems, explaining evidence, and drawing conclusions. The competency aspect also includes indicators of the ability to recognize science questions or news, recognize what evidence is needed in a scientific investigation, and recognize conclusions in sync with available evidence.

According to Lestari (2018), in terms of competence/process, 47% use the less than one category. The results of research by Sumanik et al. (2021), procedural aspects are in a low category (N-gain -0.10). In Jufri (2017) PISA views science learning as a function of preparing future citizens.

According to Zuriyani (2012), therefore, science education needs to spread the ability of students to know the nature of science, the process (science competence), and the strengths and weaknesses of science. Rositawati (2018), also said the thinking processes involved in the scientific process include inductive and deductive reasoning, critical and integrated thinking, changing representations, constructing explanations based on data, and thinking using mathematical models. Student literacy skills can develop so that they become even better not only in science learning, so that later students can become educators who can channel knowledge well to students.

According to Islami (2013); Mahanal et al. (2022), low problem-solving ability also shows low student reason, almost the same as low analysis of texts/articles, but in this case it is creative sense. According to Marlina (2019), The ability to think creatively (creative thinking) is strongly related to the ability to find and make appropriate solutions to the problem at hand. According to Rusdi et al. (2017), The ability to think creatively to solve problems is positively correlated with the difficulty level of the problem. Simple problems will be easily solved by ordinary or conventional ways of thinking. However, for difficult, complicated, or new problems, the usual way of thinking is no longer adequate. Students must use creative thinking to solve these problems in the right way.

Science literacy ability, especially in the aspect of science competence of students of the biology education study program at Labuhanbatu University, is influenced by several factors, based on the results of questionnaires used in research revealing factors that affect students' science literacy abilities including: interest in science, motivation to study in attending lectures, reading habits or low interest in going to the library and the facilities or infrastructure completeness on campus.

Unequal high school backgrounds shape interest in multiple sciences. Most students have a relatively low interest in science. According to Rini et al. (2021), the science learning method used by lecturers must arouse students' scientific attitudes, motivate students in solving problems given by lecturers, and spread students' science process skills and critical thinking. The facilities and infrastructure owned by the campus are still limited as a result they cannot support the development of students' science literacy skills.

### **Attitude Aspect**

Attitude aspects include scientific attitudes, scientific attitudes which are often also called attitudes towards science play an important role in the decisions of learners in developing further science knowledge, continuing careers in science, and using scientific concepts and methods in their lives (Jufri, 2017).

There are 3 indicators in the attitude aspect, namely 1) supporting scientific inquiry (understanding the importance of considering different scientific perspectives and scientific arguments.), 2) confidence as a science learner and 3) interest in science. The results of the study were distributed on indicators supporting scientific investigation (understanding the importance of considering the disparity of scientific perspectives and scientific argumentation) percentages of 5.35% (III) and 3.57% (V), indicators of confidence as science learners of 32.14% (III) and 26.78% (V), and indicators of interest in science 28.57% (III) and 17.85% (V).

The percentage of tests obtained is still in the low category of <50%. Students who have a low interest in science are proven using tests, interviews and observations that students are not too active in asking. Indicators of interest in science are not only asking questions but also often reading to add broader insight.

The frequency of student reading is less in the context of reading textbooks and knowledge to add broader insight is proven that students do not like to read newspapers and articles on the internet, especially those related to science. Students prefer to read novels or news stories about celebrities.

### **Knowledge Aspect**

The knowledge aspect of science refers to the basic concepts of science that are necessary to understand natural phenomena and changes made to nature through human activities (Narut & Supardi, 2019; Irsan, 2021). The selection criteria of science content are relevant to real situations

(facts) and constitute important knowledge and long-term use (Novili et al., 2017).

The results of research on aspects of knowledge, namely indicators, show scientific investigation with a percentage of 25.00% (III) and 14.28% (V). In this indicator, students are required to determine the problem formulation based on an available graph. The percentage shows that the student's ability in that regard is still in the low category.

The factors that cause it are students who are not accustomed to doing problems related to science in the form of discourse and lack of interest in reading every day and also rarely visit the library and some have never even visited the campus library. This also affects the low knowledge of students in science literacy. Hasil penelitian pada aspek pengetahuan yaitu indikator menunjukkan penyelidikan ilmiah dengan persentase sebesar 25.00% (III) dan 14.28% (V).

As a biology teacher candidate, you must have high science education skills (Safari et al., 2020; Sari, 2021). Inpersonally, the quality of science literacy of prospective biology teachers in the future will have a major impact on biology learning in schools. If biological education students have low science literacy skills, it is feared that biological classes at school are not good, so that students' ability to understand biological materials is also low. Even if science literacy is associated with other educational uses, aspects of social life related to individual activities.

Science literacy skills are needed to improve especially in biological concepts, this activity is designed to improve students' reading and writing skills. This will make biology teachers in the future not only able to improve the learning of biological sciences but also become a teacher who can transfer their knowledge well to their students.

## **D. Conclusion**

The scientific literacy ability of Biology Education Study Program students are not good in several aspects, so they need to be improved. It was concluded that the science literacy ability of students of biology education study events is still classified as "low". The highest science literacy ability was in the content aspect of 35.71% while the lowest test score in the attitude aspect was 3.57%. It can be seen that there are still many content contexts and basic scientific concept processes that have not been maximized. There are still many prospective biology teachers who do not understand in depth the concept of biology in scientific literacy.

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