Description Analysis of Student's Scientific Literacy Skills in Biology Learning

*Masru'ah[1], Zumrotun Ni'mah[2]
[1]MA Raudlatul Ulum, Pati
*Emai:masruahypru@gmail.com

Abstract

In the 21st century, technology and information developments have spurred education to adapt and improve the system. Education is not only aimed at providing knowledge but also improving various skills in an effort to produce a smart and skilled young generation. Instilling and increasing students' scientific literacy skills is an action that can be done. Scientific literacy is the ability to fully and accurately understand science so that the students have sensitivity to themselves and their surroundings and can make decisions based on scientific considerations. The research purpose was to analyze students' scientific literacy in biology learning. This research is quantitative. Data collection using test and non-test methods. The data analysis shows that students' scientific literacy abilities are in the medium category. The results are expected to be an illustration for educators to be able to make improvements in the teaching and learning process.

Keywords: biology, scientific literacy, students

Abstrak

Pada abad ke-21, perkembangan teknologi dan informasi telah memacu dunia pendidikan untuk beradaptasi dan melakukan perbaikan sistem. Penyelenggaraan pendidikan tidak hanya bertujuan untuk memberikan pengetahuan tetapi juga meningkatkan berbagai keterampilan bagi peserta didik, sebagai upaya mencetak generasi muda yang cerdas dan terampil. Salah satu tindakan yang dapat dilakukan adalah melalui penanaman dan peningkatan kemampuan literasi sains siswa. Literasi sains merupakan kemampuan seseorang untuk memahami sains secara utuh dan tepat sehingga diharapkan memiliki kepekaan terhadap diri dan lingkungan sekitar serta mampu mengambil keputusan berdasarkan pertimbangan ilmiah. Tujuan penelitian ini adalah menganalisis literasi sains siswa dalam pembelajaran biologi. Penelitian ini bersifat kuantitatif. Pengumpulan data dilakukan dengan menggunakan metode tes dan non tes. Berdasarkan hasil analisis data, dapat disimpulkan bahwa kemampuan literasi sains siswa berada pada kategori sedang. Hasil penelitian ini diharapkan dapat menjadi gambaran bagi para pelaku pendidikan untuk dapat melakukan perbaikan dalam proses belajar mengajar.

Kata Kunci: biologi, literasi sains, siswa

A. Introduction

Technology and science are developing rapidly. It spurs humans can adapt to changes and developments in various aspects of life, one of which is in education. All sectors of life that are integrated with technology require the Indonesian people to master new skills and knowledge. Demands in the 21st century cause the education system to be by the times. One of the skills that Indonesians must have in the 21st century is literacy skills in reading, mathematics, and science (Nurhasanah et al., 2020).

According to Nurhkolis (2013), education is a process of changing attitudes and behavior through teaching and training efforts, processes of action, and ways of educating as an effort to mature humans. Generally, in Indonesia, accessing a formal education can be reached through school or madrasah. Madrasah is an educational institution to teach and study the teachings of Islam, science, and other skills that developed in its time. Although based on religious knowledge, madrasah also trains the students with scientific literacy skills. It aims to provide students with sufficient provisions to compete in various fields.

Asyhari (2015) argues that scientific literacy is the ability to understand, communicate, and apply scientific knowledge to solve problems. someone who has good scientific literacy skills, then he will have a high sensitivity to himself and his environment and be able to determine the right attitude in making decisions based on scientific considerations. The 2015 PISA data shows that Indonesia got a low score on children's scientific literacy. The average score for Indonesian children's scientific literacy is 382. Indonesia ranks 64th out of 65 participating countries (Salamah & Rusilowati, 2017). In this case, madrasah has an important role to provide scientific literacy teaching for madrasah students, so they can adapt to developments in technology and science.

Efforts to increase scientific literacy skills require educators or teachers to provide appropriate treatment according to student characteristics. Appropriate treatment can be determined by measuring the level of students' scientific literacy abilities. Therefore the research is conducted to determine the level of students' scientific literacy skills (in biology subject) in madrasah. This research is useful for teachers or instructors as reference material to evaluate students' scientific literacy skills. Then the data obtained can be used as a reference and a basis for making efforts to improve the quality of science learning in madrasah. In addition, it is hoped that this research can be a trigger for other teachers to conduct further research.

According to Kamus Besar Bahasa Indonesia (KBBI), education comes from the word "to educate" which means to maintain and provide training (teaching, leadership) regarding morals and intelligence (Nurhkolis, 2013). Karima & Ramadhani (2017) explained that education is defined as a conscious and planned effort to encourage students to increase their potential through the teaching and learning process. It aims to instill and develop spiritual strength, personality, noble character, self-control, intelligence, and skills needed by society, nation, and state. So it can be concluded that education is a conscious effort to form students who have various knowledge and skills that are useful in their lives. In the 21st century, education is not only interpreted as education in the cognitive sphere, but also includes values or ways of thinking (mindset) which will then develop into abilities and skills (Sutrisna, 2021). Every student must have 21st century educational competence. It is defined as a combination of knowledge competencies, skills, attitudes, and values.

Madrasah is Islamic educational institutions that combine Islamic boarding schools and schools by integrating religious material and general knowledge. Madrasah as educational institutions function to maintain good old values and adopt new values to be utilized in life both in science, technology, and economics (Riadi, 2016). In this case, madrasah has complete characteristics to respond to the challenges of education in the 21st century.

Scientific literacy requires people to learn science, think creatively, make decisions, and solve problems. Literacy is one of the most discussed topics in the academic field. It is because scientific literacy has many benefits for students, including (1) providing personal satisfaction and pleasure that arises after understanding and learning science; (2) sharpen the ability to process information and think critically; and (3) training skills in conveying arguments (Sutrisna, 2021).

In essence, science is (1) a body of knowledge; (2) a way of investigating; (3) a way of thinking; and (4) the interaction of science, technology, and society (Salamah & Rusilowati, 2017). All the essence of science shows that it has great benefits for humans. Therefore, a teacher or educator must understand the essence and concepts of science in order to be able to provide comprehensive knowledge for students, so that they can acquire comprehensively science and knowledge that can be applied in everyday life.

B. Method

This research is quantitative research. According to Sugiyono (2018), a quantitative research is a research design that uses statistics to process and analyze the data obtained. The research method used is descriptive research method.

The research population used was all students of class X majoring in Mathematics and Natural Science of Madrasah Raudlatul Ulum in the 2022/2023 academic year. The sampling technique was done randomly. The instruments used in the research were in the form of test and non-test instruments (interviews and observations). The test instrument is the form of a set of questions. It has been tested for validity by the experts, including (1) the validity of the material/content, (2) construction, and (3) language. Then the acquisition of test scores is analyzed by adding the appearance of the scientific literacy indicators for each category.

$$\text{The percentage of scientific literacy category} = \frac{\sum \text{indicators for each category}}{\sum \text{category total indicator}} \times 100\%$$

The student's overall test scores are then added up to get the student's overall score. The next step is to calculate the class mean (X) and standard deviation (SD) obtained. The determination of the category of student scientific literacy is carried out based on the Table 2.1.

Table 2.1 Category of Students' Scientific Literacy (Arikunto, 2017)

Provision	Category
Students scores > X + SD	High
X - SD ≤ Students scores ≤ X + SD	Medium
Students scores < X - SD	Low

C. Result and Discussion

Measurement of student literacy was carried out with test and non-test instruments. The test instrument was used in the form of 20 questions about the biodiversity. The questions

made include 4 natures of science, including (1) the body of knowledge; (2) how to investigate; (3) ways or ways of thinking; and (4) interactions between science, technology, and society (Chiapetta et al., 1991). The instrument that has been made is then tested on 50 students of class X. The study was conducted to determine the level of students 'scientific literacy skills.

Table 3.1 Analysis of Students' Scores

Statistics	Score
Maximum	95
Minimum	35
Average	64
Standard deviation	13

Table 3.2 Categories of Students' Scientific Literacy

Score	Categori	Frequency
Student score >77	High	6
51 ≤ Student score ≤ 77	Medium	34
Student score < 51	Low	10

The data analysis shows that the scientific literacy of madrasah aliyah students is included in the medium category. The same thing was also found by Arohman et al., (2016) and Sari et al., (2022). They stated that the level of Madrasah Aliyah students' scientific literacy was included in the moderate category. Meanwhile, Diana et al. (2015), and Nadhifatuzzahro et al., (2015) said that students' scientific literacy skills are still in the low category.

Table 3.3 Analysis of Scientific Literacy Dimensions

Scientific Literacy Dimensions	Score	Percentage (%)
Science as a way of investigation	140	56%
Science as a way of thinking	159	64%
Science as a body of knowledge	146	58%
Interaction of science, technology, and society	195	78%

Table 3.3 shows that the interaction of science, technology and society dimension has the highest percentage. It has a nominal value of 78%. Besides, science as a way of investigation dimension has the lowest percentage. It has a nominal value of 56%. The low ability of students' scientific thinking can be influenced by the existence of a one-way learning culture (in the form of lectures) in the learning process. It is because students are only accustomed to listening so they do not lack a high sense of curiosity. Budiningsih et al. (2015) explains that scientific literacy can be developed through learning patterns and the use of teaching materials oriented towards scientific literacy (Ummah et al., 2018).

According to Setiawan (2019), learning biology should be oriented towards scientific literacy rather than getting used to practicing questions. Scientific literacy-oriented learning

seeks to develop students' skills, not only foster students' theoretical knowledge. Based on research conducted by Sari et al. (2022), students' scientific literacy skills can be increased by being given lots of stimuli that can spark students' curiosity, as well as being given space to put forward questions and arguments. (Salamah & Rusilowati, 2017) explained that there are four important aspects in scientific literacy, namely (1) the concept of science and its application in daily life, (2) the process of scientific inquiry, (3) understanding the science, and (4) understanding the relationship between science, technology and society.

Table 3.4 Analysis of Scientific Literacy Indicators

Dimensions of scientific literacy	Indicator	Percentage (%)
Science as a way of investigations	Able to link multiple information	38
	Able to apply the scientific approach	32
	Able to make hypotheses based on exploration	30
Science as a way of thinking	Able to group based on observation	44,05
	Able to interpret the results' observations	23,88
	Able to conclude based on available data	32,07
Science as a body of knowledge	Able to accumulate information	43,15
	Able to apply knowledge concepts in solving problems	16,44
	Able to accumulate information to gain knowledge	40,41
Interaction of science, technology, and society	Able to integrate science and technology	35,38
	Able to apply science and technology in society	41,54
	Able to solve problems with a social and scientific approach	23,08

The results showed that the indicators capable of grouping based on observations had the highest percentage value, which was 44.05%. Besides the indicator of being able to apply knowledge concepts in solving problems has the lowest percentage value, which was 16.44%. The low result is due to students' limited understanding of biology concepts in theory, making it difficult to apply in daily life. The research of Nasution et al. (2019) shows that the majority of teachers prioritize students to be proficient in mastering the material. According to Suhirman (2020), learning science with a problem-based approach can affect scientific literacy skills. Based on the description above, educators and teachers should be able to develop students' scientific literacy. So that students can gain success in the learning process as well as in real life.

D. Conclusion

The dimensions of scientific literacy include (1) a body of knowledge, (2) a way of investigating, (3) a way of thinking, and (4) the interaction of science, technology and society. The research shows that the students' scientific literacy skills at Madrasah Aliyah Raudlatul Ulum are in the moderate category. Factors that influence students' scientific literacy skills include learning methods and media. For this reason, it is hoped that the results of this research can be an illustration for educators so they can determine the right steps so that the goal of increasing student scientific literacy can be achieved.

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