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Exploring Scientific Literacy on Ecosystem Concept Among Eleventh Grade Students in an Indonesia Tahfiz-Based Islamic Senior High School

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Abstract

Background: *The mastery of science literacy has a very important role in daily life, both for students and society as a whole. Mastery of science literacy provides significant advantages, both at the individual and collective levels. They purpose of this studying as to describe the levels of science literacy ability of high school student on Madrasah Aliyah Tahfizil Qur'an of the North Sumatra Islamic Centre Foundation especially ecosystem materials, both in understanding and mastering scientific concepts related to ecosystems, as well as to assess critical thinking skills, ability to communicate scientific findings, and environmental awareness.* **Methodology:** *The method used in this study is to use a type of cross-sectional quantitative research research. The sample used was 60 students with a sampling technique using a total sampling technique. The research instruments us a that studying is an they to if science literacy questions in the form of multiple choices. This study's data analysis methodology employs quantitative descriptive analytic approaches to examine students' science literacy outcomes, which are represented as percentages.* **Findings:** *Results obtained on the ability level of second grade students in Madrasah Aliyah Tahfizil Qur'an of the North Sumatra Islamic Centre Foundation is in the medium category, with an average score of 72. This research shows the need for a more relevant learning approach to improve the understanding and application of ecosystem concepts in a scientific context. The importance of integration between the national curriculum and the religious approach applied in madrassas so that students not only understand the concept of science theoretically, but also can apply it in daily life.* **Contribution:** *This research is expected to participate in designing more effective science learning strategies in religion-based madrasah schools.*

Keywords: *Cross-Sectional Survey; Ecosystem Materials; Student Ability; Scientific Context; Science Literacy*

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INTRODUCTION

The 21st century emphasizes the importance of science literacy as an integral part of education that prepares individuals to face increasingly complex and dynamic global challenges (Limiansih & Susanti, 2021). According to McFarlane (2013), the 21st century must adapt to new challenges and opportunities to improve science literacy and national competitiveness. In the 21st century, it is emphasized that humans need to master four main competencies: literacy, creativity in thinking, the ability to communicate effectively, and high productivity. According to Anderson et al., (2021), the concept of literacy itself has developed, not only reading and writing skills, but now also includes critical thinking skills. In addition, this ability is one of the important things to face various challenges in this era (Bagasta et al., 2018; Budsankom et al., 2015). Understanding and having a basic concept of science and technology can really help in dealing with various problems in daily life. (Syahidi et al., 2023).

The concept of science literacy includes a series of scientific competencies that allow a person to formulate questions, acquire new information, interpret natural phenomena, an drawing conclusion base a factual date (Nudiati & Sudiapermana, 2020). Science literacy has a basic understanding of scientific concepts, such as physics, biology, chemistry, and earth sciences, as well as how these concepts are interconnected. The ability to utilize scientific information and abilities to comprehend and make judgments pertaining to the natural world is known as science literacy (Murti et al., 2018). Science literacy is consistent with scientific knowledge, which shows the need for changes in science teaching (Creswell, et al., 2016).

Knowledge (vocabulary, facts, and concepts), processing skills (intellectual and skilled), and disposition (behavior & attitude) are all components of science literacy, which is a multifaceted talent, and its relationship with facts in the environment (Dwisetiarezi & Fitria, 2021). Science literacy skill as needed from student at analyze problems and connect with various scientific facts. It is employed in decision-making when addressing issues pertaining to natural occurrences and how they affect human activity (Fadilah et al., 2020). Knowledge or science concepts are a link to understand concepts related to physics, chemistry, biologys and earth sciences. The process of science is the ability to predict scientific phenomena, understand scientific investigations understand scientific research and draw conclusions based on existing evidence Arohman et al, 2016).

Mastering this ability has an important role in daily life, both for students and society as a whole (Huryah et al, 2017). According to the opinion of (Rahmadani et al., 2018), mastery of science literacy provides significant advantages, both at the individual and collective levels. On a personal level, those who have qualified science literacy skills can overcome various problems by applying the scientific principles that they have mastered (Hasan et al., 2018; Toharudin, 2011). Science literacy allows a person to understand natural phenomena, biological processes that exist in the surrounding environment, then science literacy can also help develop critical thinking skills (Yulianti, 2017). However, it should be noted that there are still many issues regarding scientific facts at this time there are still many information

issues that are not in accordance with the rules, for that it is necessary to make efforts to avoid this. One of the efforts that can be made is to increase science literacy to enable more informed decision-making and avoid misinformation about science issues (Anderson et al., 2021).

However, the level of science literacy among Indonesian students has not reached the expected level (OECD, 2018). To obtain scientific literacy results level in Indonesia, the assessment used refers to the results of the PISA assessmen, because PISA is a program that can survey knowledge about science, identify problems, and build conclusions based on scientific evidence about science issues from time to time (Griffin & Ramachandran, 2010). OECD (2023a) declared In 2006 it obtained an average of 393, then in 2009 there was a decrease in the score of 383, in 2012 the literacy level of Indonesian students greatly decreased with a score of 382, then in 2015 the level of science literacy experienced a significant increase of 403, in 2018 there was a decrease in the score of 396. Then, with an average score of 383 in 2022, Indonesia was ranked 67th out of 81 participating nations in the science category. According to a trend analysis of PISA results over time, Indonesian students' science literacy development tends to be stable, not even exhibiting a discernible gain. Actually, when compared to the 2006 score, science accomplishments in 2022 declined.

Biology is one of the science-centered topics that must strive for science literacy (Nofiana et al., 2018). There is a strong correlation between science literacy and biology education, according with Schwartz & Sadler (2007) opinion that good science literacy involves not only understanding the scientific content, but also about the scientific process itself. Science literacy skills will have an influence on biology learning outcomes. This can be seen in the research conducted by Dinata et al., (2018), where researchers carry out learning activities in nature to explain the ecosystem and obtain higher learning outcomes compared to learning activities carried out conventionally. In addition, in research conducted by Setiawan (2019), It is evident that teaching with a scientific method can help students develop their scientific literacy skills. In addition, the mastery of science literacy in biology learning can also affect how students make decisions about nature and adapt cognitive theories to their level (Ardiyanti et al., 2019).

In a previous study condukted bye Durasa et al., (2022), researchers also researched student science literasy skill a biology lessons, namely global warming material as they junior high school level. In the research studied by Angrelia et al., (2021), This study examined students' science literacy abilities as well, although it wasn't primarily focused on the resources used in biology classes. Furthermore, in the research studied by Pratama et al., (2024); Arohman et al., (2016), the research also examined the science literacy ability of students in biology lessons, namely ecosystem materials but at the junior high school level. Furthermore, in the research studied by Manzulina et al., (2024), this research also examines the analisys if the sciences literasy abilities if highs schools student's at Mataram onn ecosystem material.

Based on previous studies, it can be concluded that there is still no research found in North Sumatra that examines the scientific literacy of high school students regarding ecosystem materials. This is also strengthened by the results of an interview with a biology teacher at Madrasah Aliyah Tahfizil Qur'an of the North Sumatra

Islamic Centre Foundation who stated that the science literacy ability of grade XI students at the school is still relatively low, the lack of effective time to study is one of the factors for the low science literacy ability of students. Therefore, It provides researchers the chance to study how well North Sumatra high school students understand science literacy in relation to ecological materials. The selection of ecosystem materials in this study is based on the opinion of Shannon & Smith (2009) who stated that ecosystem materials are very closely related to students' mastery of science literacy because They give them a foundation for comprehending how living things interact with their surroundings.

In addition, ecosystem materials help students connect scientific theories with real-world phenomena, such as understanding the impact of human activities on ecosystem sustainability. This encourages them to develop skills in applying scientific knowledge in real-world contexts, which is an important part of science literacy. Overall, ecosystem materials function as a very effective means in strengthening students' mastery of science literacy, both in terms of understanding concepts, critical thinking skills, application of science, scientific communication, and the formation of attitudes that care about the environment. Therefore, the selection of ecosystem materials is very relevant to the researcher based on this explanation, The purpose of this study is to characterize the degree of scientific literacy regarding ecosystem materials that high school students at Madrasah Aliyah Tahfizil Qur'an Yayasan Islamic Centre North Sumatra possess, both in understanding and mastering scientific concepts related to ecosystems, as well as to assess their critical thinking skills, ability to communicate scientific findings, and environmental awareness. It is anticipated that this study will aid in the creation of a more effective and pertinent science curriculum at madrasas, as well as improve students' science literacy which not only includes knowledge, but also scientific attitudes and skills needed in daily life.

METHOD

Research design and methods

Descriptive quantitative research using a cross-sectional survey design is the methodology employed. According to Sugiyono (2019), cross-sectional survey is an observational research where data is collected at a certain time from a population or sample. This study uses a cross-sectional survey design because it aims to obtain an overview of the overall level of students' science literacy ability in a period of time. The design allows researchers to analyze the relationships between variables in an efficient and practical way.

Population and Sample

The population in this study is grade XI students of Madrasah Aliyah Tahfizil Qur'an of the North Sumatra Islamic Centre Foundation. A complete sampling technique was employed in this study, and the sample consisted of 60 student, all of whom were second grade-class XI students. According to Sugiyono (2019), Using each individual of the population as a sample is known as total sampling.

Research Instruments

The test with multiple-choice questions served as the study's instrument. The science literacy test is prepared with ecosystem material using reference metrics included in the TOSLS's creation (Test of Scientific Literacy Skills) test tool by Gormally et al., (2011). The table of TOSLS indicators and sub-indicators is presented in Table 1.

Table 1. Categories of indicators and sub-indicators in TOSLS

No	Indicators	Sub Indicators	Sample Questions
I	Understanding inquiry methods that lead to knowledge scientific	Identifying the right scientific arguments	Students are given a statement of a scientific argument about the ecosystem, then students identify which statement is valid.
		Using an effective literature search	"A picture and an article excerpt about recovery in environmental pollution" is provided, then students identify whether the source is accurate or not.
		Evaluation in using scientific information	"A statement about the balance of the ecosystem is given", then students are directed to evaluate whether the explanation of the information conveyed in the quotation is correct or not.
		Understand the components of research and how they affect scientific discovery	"Given a The title of the research "The role of the evaporation process on the formation of rain", from the title of the research students are directed to understand which variables with a suitable and appropriate research design.
II	Classify, Grouping, Describing and deciphering scientific data	Describe a graph describing the results	"Given a statement about natural disaster cases in Indonesia in 2024", then students are directed to analyze which graph is

		most appropriate to display the statement.
	Understanding and Explaining data	"Given a graph about the biodiversity of flora in Indonesia", then students are directed to interpret from the graph data above which is the most accurate and correct conclusion.
	Problem-solving using quantitative capabilities including probability statistics	"A statement is given about the amount of rainfall (in mm) every day for one week during the rainy season", then students are directed to calculate what is the lowest and highest rainfall? What is the total amount of rainfall during the week?
	Understand and be able to interpret basic stats	"Given a statement of scientific statistics regarding the number of flora and fauna in Indonesia in 2024", then students are directed to interpret which statement is correct according to the data.
	Providing conclusions, Estimates based on quantitative data	"Given a hypothesis about forest destruction in Indonesia", then students are directed to analyze the strongest conclusions against the hypothesis.

Test The Validity and Reliability of Science Literacy Questions

The research instrument is first tested to ensure the validity and reliability of the questions to the validator expert. The questions' validity and reliability are tested using a single question validator, where the validator is selected from other universities that fit the research's focus, which is science literacy, and possess at least an Magister background as well as expertise in creating tools and skills related to the topic of science literacy. The validation mechanism is carried out by providing a validation sheet

containing aspects of content, construction and language that are assessed using a Likert scale, then the validator expert provides revisions to questions that are not in accordance with the validation criteria. Then the results of the validation that are appropriate will be analyzed quantitatively and qualitatively, then used as a basis for improving the instrument before being used in the trial.

Testing the Validity of Science Literacy Questions

A test is said to be valid if the test measures what is to be measured (Arikunto, 2019). To facilitate the analysis process, the validity test of the science literacy test items in this discussion was carried out using the help of the IBM SPSS Statistics 25 application. The criteria for making a decision on validity, namely whether an item is valid or not, can be decided through a comparison of the value obtained with the value in the table that uses a significance level of 5%. If r counts > r table means valid and if r counts < r table means invalid, the r table with a significant level of 5% in this study is 0.254 (with a sample of 60 students) or is carried out with the criteria if the Sig (2-tailed) value < 0.05, then the test item is declared valid.

Table 2. Results of the Validation Test for Science Literacy Questions

Question points	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**
Calculation	.649**	.364	.908**	.767**	.764**	.795**	.721**	.795**	.869**
Table	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367
information	Valid	Invalid	Valid	Valid	Valid	Valid	Valid	Valid	Valid

Based on table 2, the results of testing the validity of the science literacy question items above, there are 8 questions in the valid category and 1 question item in the invalid category. In these 8 science literacy questions which are used as research instruments in Madrasah Aliyah Tahfizil Qur'an Islamic Centre Foundation North Sumatra.

Testing The Reliability of Science Literacy Questions

Reliability is the level of trust of a question, whether it is a matter of providing fixed or variable results. So the definition of test reliability is related to the problem of determining test results (Arikunto, 2019). A measuring instrument can be said to be reliable if it always gives the same result every time it is applied to the same object situation. An item is said to be reliable or reliable if the answer to the statement remains consistent or stable over time. Thus, measurements with high reliability can produce reliable data. The correlation coefficient criteria used in this discussion are the correlation coefficient criteria proposed by Nunnally and Streiner (Yusup, 2018). The question is said to be reliable if the reliability coefficient of Alpha Cronbach is more than 0.70 (rhitun> 0.70), but the reliability coefficient of Alpha Cronbach, should not be more than 0.90 (calculation< 0.9). If the reliability coefficient of Alpha Cronbach is more than 0.90 (calculated> 0.90). Based on the results of the reliability test of the questions above, all questions are covered by 8 items, all questions are reliable, because

of the 8 questions it is below 0.90 (calculated< 0.9) according to the correlation coefficient criteria used.

Table 3. Reliability Test for Science Literacy Questions

No.	Cronbach's Alpha if Item Deleted
Item_1	.853
Item_2	.853
Item_3	.853
Item_4	.853
Item_5	.860
Item_6	.860
Item_7	.860
Item_8	.860

Data Collection Techniques

Data collection in this study was carried out at one time, where data was taken from grade XI students of Madrasah Aliyah Tahfizil Qur'an Yayasan Islamic Centre North Sumatra which amounted to 60 data samples, students were given science literacy questions in the form of multiple choice as many as 8 questions using 4 answer choices using answer options (A, B, C and D). In the question there are 9 sub-indicators that are examined, namely, Identifying the right scientific arguments, By conducting a thorough literature search, Using data from science to evaluate, Knowing the components of research design and how they affect scientific findings, Creating data-representative graphics, Analyzing and evaluating information, Using mathematical skills, such as statistical probability, to solve problems Knowing and being able to decipher basic statistics and give a synopsis and an estimate based on the findings.

Data Analysis Techniques

The data analysis used in this study uses quantitative descriptive analysis techniques on students' science literacy outcomes expressed in percentages. The quantitative data obtained is presented in the form of tables and diagrams (Sugiyono, 2019). The science literacy score is calculated using the formula 1 as stated by Arikunto (2019). The results of the calculation in percentages are then grouped according to the assessment category. According to Slavin (2018) the assessment category is divided into three as shown in Table 4.

$$Science\ literacy\ (Value\ \%) = \frac{Score\ earned}{Max\ Score} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Table 4. Science Literacy Achievement Criteria

No.	Value range (%)	category
1	90 - 100	Very High
2	80 - 89	Tall
3	70 - 79	Keep
4	60 - 69	Low
5	< 60	Very Low

RESULTS AND DISCUSSION

Students' Science Literacy Skills

Based on the data obtained on the science literacy ability of grade XI students at Madrasah Aliyah Tahfizil Qur'an of the North Sumatra Islamic Center Foundation, it was obtained by calculating the scores of the results of students' science literacy skills. Based on the results of the study, it is known that 8.3 % of students are in the very high category with a total of 5 students, then 20 % of students are in the high category with a total of 12 students, with a total of 21 students, 35 % of the students fall into the medium group, 16.6 % fall into the low category with 10 students, and 20 % fall into the extremely low category with 12 students. The average science literacy ability of students as a whole is 72, where this science literacy of grade XI students at Madrasah Aliyah Tahfizil Qur'an Islamic Center Foundation North Sumatra is included in the medium category (Table 5).

Table 5. Data of Students' Science Literacy Ability

No.	Category	Score Interval	Frequency	Score	Percentage
1	Very High	90-100%	5	500	8.3
2	Tall	80-89%	12	1.050	20
3	Keep	70-79%	21	1.575	35
4	Low	60-69%	10	625	16.6
5	Very Low	< 60%	12	562.5	20
	Total		**60**	**4.312**	**99.9**
	Mean			**72**	

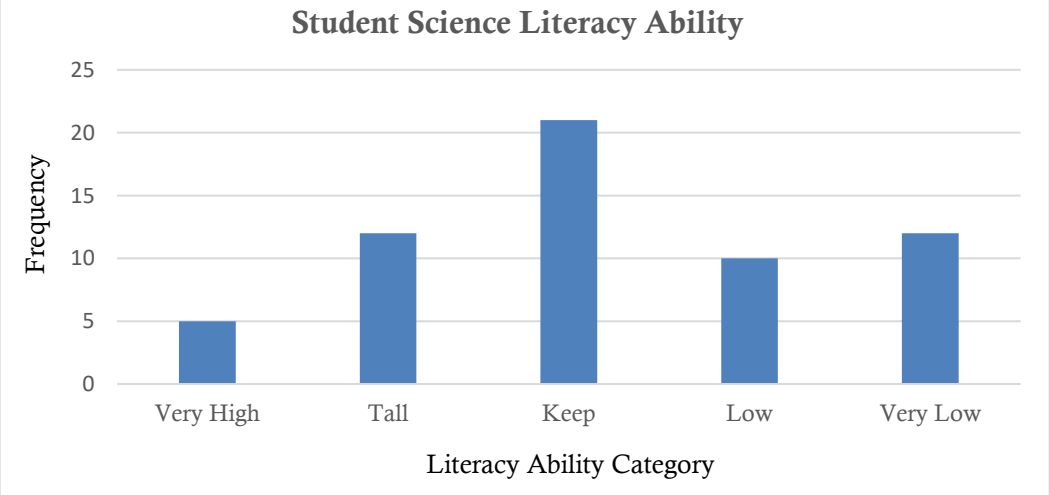

Figure 1. Student Science Literacy Ability Score Category Chart

For more clarity, the following will be presented a graph diagram of the score that students obtain in solving science literacy ability questions. The selection of science literacy indicators used in this study was selected based on the indicator table and sub-indicators of TOSLS (Test of Scientific Literacy Skills), these two indicators provide an encouragement to explore certain aspects of science literacy in more detail and depth, rather than covering all indicators superficially. This focus helps improve the quality of data analysis and interpretation.

Indicators Understand Inquiry Methods That Lead To Scientific Knowledge

The total average score of students is 60.2, falling into the low category, according to the value of their science literacy skill on the indicator of knowing the inquiry technique that leads to scientific knowledge. The average score of class XI Science A was 93.7, the score of class XI B was 76.7 and the score of class XI Science C was 10.3 (Table 4).

Table 6. Indicator of Understand Inquiry Methods That Lead To Scientific Knowledge

No	Class	N	Value Acquisition
1	XI IPA A	20	93.7
2	XI IPA B	19	76.7
3	XI IPA C	21	10.3
	Grade Point Average		**60.2**
	Category		**Low**

Indicators Classify, Grouping, Describing and Deciphering Scientific Data

The average score attained by all students is 89.4, which falls into the high group, according to the value of students' science literacy skill in the indicators of organizing, analyzing, and interpreting scientific material and quantitative data. The average score of class XI Science A was 96.2, the score of class XI B was 102 and the score of class XI Science C was 70.2 (Table 5).

Table 7. Indicator of Classify, Grouping, Describing and deciphering scientific data

Yes	Class	N	Value Acquisition
1	XI IPA A	20	96.2
2	XI IPA B	19	102
3	XI IPA C	21	70.2
	Grade Point Average		**89.4**
	Category		**Tall**

Table 8. Comparative Mastery of TOSLS Indicators Between Classes

No.	TOSLS Indicator	Science Class A (%)	Science Class B (%)	Science Class C (%)	Comparison Remarks
1	Identifying the right scientific arguments	86.9	65	78.25	Science class A (high), science B (Low) and science C (medium)
2	Using an effective literature search	100	90	100	Science grades A, B and C (very high)
3	Evaluation in using scientific information	100	90	100	Science grades A, B and C (very high)
4	Understanding research design elements	56.5	65	65.2	Science class A (very low), science B (low) and science C (low)

	and how it impacts scientific discoveries				
5	Create charts that can represent data	91.3	85	78.2	Science class A (very high), science B (high) and science C (medium)
6	Read and interpret data	78.2	80	43.4	Science A (medium), science B (high) and C science (very low)
7	Problem-solving using quantitative capabilities including probability statistics	60.8	65	13.4	Science A and Science B (low), and Science C (very low)
8	Understand and be able to interpret basic stats	95.6	95	91.3	Science class A, science B, science C (very high)
9	Presenting conclusions, predictions based on quantitative data	95.6	85	65.2	Science class A (very high), science B (high) and science C (low)

The findings of students' science literacy performance in each indication demonstrate that organizing, analyzing, and interpreting scientific knowledge and quantitative data is the science literacy indicator with the highest attainment, which is with an average score of 89.4 classified as high. Then the next indicator, namely the second indicator, understands the inquiry method that leads to scientific knowledge, namely with an average score of 60.2, classified as low.

Based on the results of the score of Minimum completeness criteria (KKM) of each class, the three classes used as a sample only one class has a completeness value based on the school's KKM, where in Madrasah Aliyah Tahfizil Qur'an Yayasan Islamic Centre North Sumatra the school KKM is 75, while the average results of the scores obtained by students in completing sola sebnayk 8 multiple choice questions are, in the Science A class, a KKM score of 76 was obtained from a total of 20 students (including passing the minimum completeness criteria), then in the Science B class, a KKM score of 74 was obtained from a total of 19 students (including those who did not pass the minimum completeness criteria) and in the Science C class, a KKM score of 65 was obtained from a total of 21 students (including those who did not pass the minimum completeness criteria).

Based on the results of the analysis of science literacy ability, it is known that the science literacy of grade XI students at Madrasah Aliyah Tahfizil Qur'an of the North Sumatra Islamic Center Foundation in solving the question of understanding the inquiry method that leads to scientific knowledge, namely with an average score of 60.2 is classified as low. This can be seen from the percentage of final results of both indicators. Based on the results of interviews with biology teachers, the problem of low science literacy of students is due to several factors, namely students are not used to working on previous science literacy questions related to research results. This is supported by the

opinion Riwanto et al., (2019) stating that students' lack of interest and motivation to repeat the material that has been learned, students are used to memorizing, and students' lack of critical thinking skills is the main cause of students' low science literacy.

Additionally, students are asked to assess and create scientific inquiries in this area, which had a low classified score according to test results on the first indicator, which is comprehending the inquiry process that leads to scientific knowledge. This indicator requires students to be able to understand and evaluate a scientific investigation and determine steps to answer questions scientifically. This indicator also includes students' ability to collaborate, communicate, think critically, and evaluatively. Students' ability to evaluate and design scientific investigations is in the low category due to students' ability to still have low knowledge (Tulaiya, 2020). The provision of exercise questions in the form of exploration and evaluation greatly supports the development of students' competencies in evaluating and designing investigations (Rahmadina et al., 2022).

Other factors that can affect students' biological science literacy skills are as follows: 1) Students are not used to working on science literacy-based questions, so this will make it difficult for students to solve them, 2) The questions given by teachers do not cover all science literacy indicators, so students are not used to analyzing science literacy-based questions, 3) students' lack of interest in reading and repeating lessons is the most important factor support in influencing students' science literacy skills. Other factors that hinder students' lack of interest in reading include teachers only implementing and implementing what the government has proclaimed in learning without supporting innovations (Huryah et al., 2017; Hasasiyah et al., 2019; Putrislia et al., 2021).

Based on the test results on the second indicator, namely organizing, analyzing and interpreting quantitative data and scientific information is categorized as high. When viewed in each indicator, the indicator of data interpretation and scientific proof of data is the highest ability. The science literacy indicator of data interpretation and proving data scientifically is the ability of individuals to analyze and evaluate data, provide responses and arguments to seek conclusions appropriately (Winata et al., 2018). According to Jufri (2017), the competence of using authentic and scientific evidence is related to a person's ability to interpret evidence, draw conclusions, and reflect on the implications of problems that arise as a result of the development of science and technology. The heavy curriculum load also affects students' science literacy skills, where when there are too many demands of material that must be mastered, educators often directly explain the subject matter due to time constraints (Rahmadina et al., 2022). In the indicator of data interpretation and ensuring that the data scientifically obtains the lowest percentage among other indicators, because students generally learn by memorization. In fact, to improve students' competence in interpreting and proving data, students cannot rely on memorization skills alone, but must be able to study to gain understanding and make arguments or conclusions to solve problems in the problem (Irwan et al., 2019).

According to Mardia et al., (2022); Novita et al., (2021) the students' literacy skills can be improved with various efforts. Based on several previous researches, science literacy can be improved by using teaching materials that have been based on science literacy, applying appropriate learning models and approaches to improve students'

science literacy, and evaluation tools in the form of assessment instruments that support teachers to evaluate students' science literacy abilities.

CONCLUSION

Based on the results, the science literacy ability of grade XI students at Madrasah Aliyah Tahfizil Qur'an of the Islamic Center Foundation of North Sumatra is in the medium category, namely with an average score of 72. As for the level of achievement of aspects or indicators of each science literacy, in particular, it can be observed that the average score attained by all students is 60.2, falling into the poor group, in the indicator of the value of students' science literacy ability and in the indicator of understanding the inquiry technique that leads to scientific knowledge. Meanwhile, all students received an average score of 89.4, which falls into the high group, for the indicator element of organizing, evaluating, and interpreting quantitative data and scientific information. The measurement of students' science literacy ability must reflect the extent to which students understand and master science concepts in depth, students' ability to reason, analyze information, and make decisions based on scientific evidence, students' concern for environmental issues and awareness of the impact of human behavior on the environment. The importance of integration between the national curriculum and the religious approach applied in madrassas so that students not only understand the concept of science theoretically, but also can apply it in daily life in addition to that it can also provide a solid foundation for teachers, especially in the teaching of biology, to design learning that not only focuses on understanding concepts, but also encourages critical thinking skills and building awareness EnvironmentThis research is expected to contribute to the development of more effective science learning strategies in religious-based madrasas.

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