

PROFILE OF SCIENTIFIC LITERACY SKILLS ON THE SUBJECT OF GLOBAL WARMING SENIOR HIGH SCHOOL IN JEMBER

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ABSTRACT

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In the 21st century, students are required to have scientific skills that are used to face globalization with advances in technology and knowledge. One of the skills that must be possessed by students is scientific literacy skills. Scientific literacy is very important to be owned and understood by students because students can analyze and understand the relationship between scientific concepts and problems that exist in the environment around students. This study analyzes profil of scientific literacy in class XI students in several high schools in Jember Regency. Scientific literacy indicators include explaining scientific phenomena, analyzing and interpreting data to draw conclusions, as well as evaluating and designing. This type of research is descriptive research with data collection by google form. Based on the google form, shows that 58% of indicators explain scientific phenomena with low category, for indicators to analyze and interpret data to draw conclusions to get 48% data in the very low category, while evaluating and designing indicators get 59% in the low category. Based on these data, it shows that the scientific literacy skills of class XI students in Jember City is still low.

KEYWORDS

Scientific Literacy, Global Warming, Education



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INTRODUCTION

Advances in Science and Technology (IPTEK) have had an influence on the development of education in Indonesia. Advances in information technology have a direct impact on the development of education because education is required to experience changes and push for the better with various efforts and maximum ways so as not to be left behind by the development of science and technology. Every year, education and the learning process have shown rapid development. This can be seen in the curriculum that continues to innovate, the methods and learning models are increasingly varied, and the facilities in schools that support learning are more advanced and better. Overall, it can be said that the changes that occur are reforms in the education system to balance and follow the progress of science and technology globally.

Education is a conscious and planned effort to create a learning atmosphere and learning process so that students are able to develop their potential actively which is useful for increasing religious spiritual abilities, self-control, personality, intelligence, noble character, and useful skills for themselves. society, nation and state (Indonesia & Nomor, 20 C.E.). The previous question has an important meaning about education, education is a responsible, comprehensive, strategic effort to improve human ability to face the future to be more efficient (Fajar & Mulyanti, 2019).

Education has an important role because education makes a major contribution to the progress of the country in the field of developing quality human resources, especially in the face of increasingly growing job competition (Irianto, 2017). One way to improve the quality of education is that students are the forerunner of future human resources. Students must have the skills needed to face job competition and competition in the era of globalization in the 21st century. Scientific literacy is one of the skills needed in the 21st century among the 16 skills identified by the World Economic Forum (Forum, 2015). Scientific literacy is the ability to use scientific knowledge, identify questions and conclude things based on evidence to understand and make decisions related to nature and changes that occur in nature through human activities (Guria, 2016). Scientific literacy is a person's ability to understand the problems that are being faced by modern people who cannot be separated from the development of science, technology and existing social problems (Nurdini et al., n.d.). In this era of globalization, scientific literacy in Indonesia is very low.

Low scientific literacy is one of the problems of education in Indonesia. This is supported by data on the average scientific literacy results of Indonesian students in the scientific literacy assessment held by the Program for International Student Assessment (PISA). Based on the results of the 2018 PISA assessment issued on December 3, 2019 that the country of Indonesia was ranked 75th out of 80 countries that took part in the PISA assessment (PISA, 2019). The deep understanding of science that Indonesian students have in general has not shown scientific literacy skills that support them in their future lives. Based on the PISA 2012 framework, scientific literacy aspects consist of context, knowledge, competence, and attitude aspects. Scientific literacy indicators include explaining scientific phenomena, analyzing and interpreting data to draw conclusions, as well as evaluating and designing.

Aspects of the context of scientific literacy involve important issues related to science in everyday life. The scientific literacy assessment items are designed for contexts that are not only limited to school life, but also in the context of students' lives in general (Ardiansyah et al., 2016). The aspect of scientific competence refers to the mental processes involved when answering a question or solving a problem (Ariana et al., 2020). In the aspect of scientific knowledge, students need to capture a number of key or essential

concepts to be able to understand certain natural phenomena and the changes that occur due to human activities (Purwanto, 2019).

RESEARCH METHOD

The research method used by the researcher is descriptive research method. In this study, the researcher did not give special treatment to the research sample used so that the researcher did not need a control class and an experimental class. In the current pandemic, researchers collect data by distributing a questionnaire in the form of a google form. There are two types of Google forms that researchers distribute. The first type of google form consists of questions about students' scientific literacy skills, while the second type of google form is about media and the learning process in schools used by physics teachers.

Research using google forms is useful for obtaining information collected from existing samples in order to get an overview relating to certain aspects or characteristics that exist in the population where the sample is. The population in this study were high school students, especially class XI majoring in science at several public high schools in Jember Regency in the 2021/2022 academic year. The researcher used a sampling technique using the cluster random sampling method which was used to take students who would be used as research samples and all students who were used as samples for this study were research subjects. The instruments used in this study were of two types, namely questions related to students' scientific literacy skills and questions related to the teaching and learning process and the media used by teachers in schools.

There are six questions in scientific literacy ability in the form of multiple choice questions, but students still write down the reasons for answering the questions. This is useful to strengthen the answers that have been answered by students. The scientific literacy skills questions used by the research are global warming material. These scientific literacy skills questions cover aspects of scientific literacy skills, namely content, context, process, and scientific attitude. The scientific literacy ability of class XI students is carried out by providing scientific literacy questions and teacher questionnaires to find out the learning used. The questionnaire used by the researcher is an indirect questionnaire, so the researcher uses the google form.

The purpose of distributing this questionnaire is to find out how the responses are about the extent of students' scientific literacy abilities, the use of media or the teaching and learning process of teachers, the needs of the teaching and learning process, and the suitability of the material provided with indicators of scientific literacy ability. The profile of students' scientific literacy abilities is the result of a post-test from a google form filled out by students. Scientific literacy ability can be described using the following formula. The scientific literacy ability profile is the result of a test using a google form that is distributed to students. Scientific literacy ability is described using the following formula (Arikunto, n.d.).

$$S = \frac{R}{N} \times 100$$

Information:

S = Value of students' scientific literacy ability

R = Number of questions answered correctly by students

N = The total number of questions of scientific literacy ability

Scientific literacy ability has a percentage of students' scores which are grouped into criteria:

Table 1. Criteria for the Percentage of Assessment of Students' Scientific Literacy Ability

No	Interval	Criteria
1	86 – 100 %	Very High
2	76 – 85 %	High
3	60 – 75 %	Enough
4	55 – 59 %	Low
5	≤ 54 %	Very Low

Purwanto (2013:103)

RESULT AND DISCUSSION

The overall achievement of scientific literacy skills was obtained by calculating the average percentage of students who answered the questions correctly on each item. The results of calculating the percentage of students who answered the questions correctly on each item are presented in Table 2 as follows:

Table 2. Percentage of Students Who Answered Correctly Each Item of Scientific Literacy Ability

No	N	Percentage
1	108	55,9 %
2	117	60,3 %
3	98	50,2 %
4	112	57,1 %
5	119	60,9 %
6	90	46,1 %
Average		55,08 %

Information:

% = Number of students who answered correctly about scientific literacy

N = Presentation of students who answered correctly about scientific literacy questions

Based on Table 2, information is obtained that the average achievement of scientific literacy skills in the aspects of knowledge and competence as a whole is 55.08% with the achievement category "low". In the results of the google form described in table 2, information is also obtained that the questions are in accordance with the indicators of scientific literacy ability. Indicators of scientific literacy ability include explaining scientific phenomena, analyzing and interpreting data to draw conclusions, as well as evaluating and designing. Based on table 2, there are six questions given by the researcher. Questions 1 and 2 use indicators to explain scientific phenomena, while questions 3 and 6 use indicators to analyze and interpret data to draw conclusions, and questions 4 and 5 use indicators to evaluate and design. Of the six questions, students got the "enough" category in numbers 2 and 5, while the "low" category was in numbers 1 and 3, and got the "very low" category at numbers 3 and 6.

Obtaining research data related to scientific literacy skills in each indicator to explain scientific phenomena, analyze and interpret data to draw conclusions, as well as evaluate and design. The results of these indicators are obtained by calculating the percentage of achievement of test results per indicator in the aspect of knowledge and

competence. This percentage is obtained by comparing the score obtained by each student with the maximum value and looking for the average value of literacy ability achievement for each indicator in the aspect of knowledge and scientific competence.

The results of the scientific literacy test analyzed per indicator on the aspect of scientific competence are presented in Table 3.

Table 3. Science Literacy Ability Test Results Per Indicator

Indicator of Scientific Literacy Ability	Percentage	Criteria
Explain scientific phenomena	58 %	Low
Analyze and interpret data to draw conclusions	48 %	Very Low
Evaluate and design	59 %	Low

Based on Table 3, information is obtained that the percentage of achievement of scientific literacy skills on indicators explaining scientific phenomena is 58% with the "low" category and the percentage of achievement on indicators analyzing and interpreting data to draw conclusions is 48% in the "very low" category. While the percentage of achievement of scientific literacy on the indicators of evaluating and designing is 59% with the "low" category.

Discussion

Based on the scientific literacy skills of students in the aspect of scientific competence, it can be seen that the highest competency indicators achieved by students in this study were indicators of evaluating and designing, then followed by indicators explaining scientific phenomena and indicators of analyzing and interpreting data to draw conclusions. The achievement of literacy skills on indicators of analyzing and interpreting data in the form of stories or pictures of the ability of students to interpret scientific evidence and draw conclusions by interpreting the data contained in several tables and pictures on the instrument of science literacy test questions used in this study. In addition, the ability to use scientific evidence is demonstrated by identifying the assumptions, evidence, and reasons behind the conclusions drawn in solving problems surrounding the concept of global warming matter.

The ability to analyze and interpret scientific data achieved by 48% is shown by students with the ability to recognize issues and key characteristics of the phenomena contained in the literacy question instrument which is made as if students are able to have the ability to investigate scientifically investigated. The ability of students to analyze scientific data certainly has something to do with aspects of scientific knowledge that students understand regarding the concept of global warming (Anisa & Mitarlis, 2020). Analytical questions on scientific literacy questions connect the cognitive aspects of students with phenomena that are often encountered in the lives of students or phenomena that exist around students. Based on cognitive learning theory, students use their prior knowledge to process new information by relating the new information to their prior knowledge (Subekti & Ariswan, 2016). The cognitive aspects contained in the memory of students' memories affect the ability of students to analyze and interpret scientific data.

Aspects of competence to explain scientific phenomena achieved by students amounted to 58% with the category of "low" achievement indicated by the ability of students to apply the scientific knowledge they have understood in solving scientific literacy problems on the concept of global warming material. The "low" category obtained in the indicator explaining scientific phenomena describes the ability of students who are not optimal in explaining scientific phenomena triggered by several factors that will affect the achievement of scientific literacy skills. Students are able to master scientific literacy

skills influenced by several factors. These factors can come from the approach or method of learning science, especially physics learning used by teachers in building the concept of global warming. Based on the results of the google form distributed to physics teachers in Jember Regency, it shows that many teachers in Jember Regency have not used learning based on scientific literacy indicators.

Optimal learning is learning that is able to arouse students' curiosity related to learning materials or problems presented by the teacher so that students feel compelled to solve problems presented by the teacher with enthusiasm and accompanied by abilities that are able to build science process skills which are a part of the aspect of scientific literacy skills. One of the suitable learning methods for science learning is the practicum method that uses the steps of the scientific method in building the concept of knowledge. This inquiry learning is also in line with constructivism-based learning which also has the potential to encourage the emergence of various skills needed to be able to master scientific literacy skills. Constructivism-based learning facilitates students to be able to construct their own knowledge in relation to the real world (Forum, 2015). The way to measure aspects of students' scientific literacy knowledge is by trying to find students' personal psychology that is built through learning topics using constructivism-based learning contexts (Sudarsana, 2018).

Based on the description of the previous paragraph, it shows that one of the physics learning activities that encourage students to be able to construct their own knowledge is to apply learning methods based on practical activities. Through practicum activities carried out in physics learning, students will get used to being able to plan their learning, carry out learning, and evaluate their learning independently. Scientific investigation is a multidimensional activity that includes observing, finding problems, investigating books and other sources, planning investigations, conducting experiments, collect data, analyze data and interpret, propose solutions, explain and present the results of the investigation (Nurdini et al., n.d.). So, students' scientific literacy skills in aspects of science knowledge and competence can be optimized through the application of practical activity-based learning. In addition to aspects of knowledge and aspects of science process skills (scientific competence), aspects of science attitudes are also important aspects that affect students' scientific literacy skills. One of the goals of science education is to be able to develop students' attitudes that make them interested in scientific issues and then acquire and apply scientific and technological knowledge for personal, social, and global benefit (Guria, 2016). One of the factors that influence the results of this scientific literacy study is the aspect of scientific attitude related to emotional factors which include interest and comfort in learning science as well as the involvement of students in learning science (Ardiansyah et al., 2016). So, aspects of knowledge, aspects of competence, and aspects of attitude affect the achievement of scientific literacy abilities of high school students.

CONCLUSION

Based on the results of research obtained from google form, it shows that the percentage of achievement of scientific literacy skills on indicators explaining scientific phenomena is 58% in the "low" category. Meanwhile, the percentage of achievement on the indicators of analyzing and interpreting the data to draw conclusions is 48% in the "very low" category. While the percentage of scientific literacy achievement on the indicators of evaluating and designing is 59% with the "low" category.

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