Profile of Students' Science Literacy Ability in Solving Physics Problems

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Abstract

The research was conducted for the profile identifying the literacy capabilities of the scientists in solving global warming materials. This is descriptive research and the method of data collection is carried out with written tests and elevation of students. The results obtained were then analyzed using quantitative descriptive methods. This study is done on 68 students of Class X in State High School 1 Kepohbaru, which showed that students of class X have very high literacy skills, although some students are still in very low categories. Scientifically phenomenal indicators have a presentation of 52%, indicators designing and evaluating scientifically research have a presentation of 40%, and indicators interpret scientific evidence and data have a Presentation of 31%. Based on the data, it can be concluded that the profile of students' ability to be scientifically literate in solving problems questions of physics is still very low. The level of science literacy ability also influences the problem solving, the better the problem resolution, the higher the profile of scientific literacy skills of students.

Keywords: Profile, Scientific literacy skills, problem solving

Abstrak

Penelitian ini dilakukan untuk profil mengidentifikasi kemampuan literasi sains peserta didik dalam menyelesaikan materi pemanasan global. Penelitian ini adalah penelitian deskriptif dan metode pengambilan datanya dilakukan dengan tes tertulis dan angket peserta didik. Hasil yang telah diperoleh kemudian dianalisis dengan metode deskriptif kuantitatif. Penelitian ini dilakukan pada 68 peserta didik kelas X di SMA Negeri 1 Kepohbaru, yang menunjukkan bahwa peserta didik kelas X memiliki kemampuan literasi sains yang sangat tinggi, meskipun beberapa peserta didik masih berada dalam kategori yang sangat rendah. Indikator fenomena secara ilmiah memiliki presentase 52%, indikator mengevaluasi dan merancang penyelidikan ilmiah memiliki presentase 40%, dan indikator menginterpretasi data dan bukti ilmiah memiliki presentase 31%. Berdasarkan data tersebut, dapat disimpulkan bahwa profil kemampuan literasi sains peserta didik dalam menyelesaikan soal fisika masih tergolong sangat rendah. Tingkat kemampuan literasi sains juga berpengaruh terhadap pemecahan masalah, semakin baik pemecahan masalah maka profil kemampuan literasi sains peserta didik semakin tinggi.

Kata kunci: Profil, Kemampuan literasi sains, pemecahan masalah

INTRODUCTION

One of the main needs of every human being is education. In creating a new generation, education is very important for the country, especially in dealing with 21st century problems. According to (Purwani et al., 2018) science education in this century requires students to have innovative thoughts and ideas, be involved in the scientific profession, and carry out scientific research. The rapid progress of development in the 21st century, humans are required to be able to develop. Scientific literacy is a really important ability to be owned by students abilities compete in the 21st century (Rosyadah Mukti et al., 2019). Scientific literacy skills is a really important ability for students who are in modern era.

Science literacy is ability For understand the process of science and scientific knowledge in daily routine (Hasan et al., 2018). Engaging scientific literacy gives students knowledge and ability to solve problems everyday, both locally and internationally (R et al., 2019). Scientific literacy influences choices made about problems facing society and individuals. Scientific literacy builds citizens who are responsive and sensitive to life's problems. Scientific literacy is also important to prepare generation that has the ability to capitalize science and information to face future challenges (Purwani et al., 2018). This in accordance with the goals of science education set out in the curriculum.

The scientific literacy abilities of Indonesian students are stay down global average averages, and

Indonesia is generally at the lowest level of PISA measurement. Indonesia's PISA assessment, Of the 41 countries assessed in 2000, With a score of 393, Indonesia is ranked 38th. Indonesia has a score of 395 and was In 2003, its position was 38 out of 40 countries. Indonesia was in 2006, it was ranked 50th out of 57 countrieswith a score of 393, and was ranked 60th out of 65 countries in 2009. In 2012, Indonesia was ranked 54th out of 65 scoring country of 382, and In 2015, Indonesia scored 403 and was ranked 69 out of 76 countries. Finally, based on the findings of a ranking survey PISA Indonesia in 2018 and the results of the index of activities related to reading literacy in 2019. Most students in Indonesia have a low literacy level (Suroso et al., 2021). This shows that students in Indonesia are still far below the international standards set by the OECD in terms of scientific literacy. The low average score also indicates that students are still not able to understand and apply ideas to solve problems. Students are very proficient at memorizing, but students are less able to use their knowledge. The phenomenon that occurs is that students do not have a strong desire to read and write (Hasasiyah et al., 2020).

One of the factors that contribute to the low level of scientific literacy that students have is their inability to complete tests or tests related to scientific literacy. (Hidayah et al., 2019). In addition, passive students lose to the teacher in the educational process. (Suzana et al, 2021). In addition, students are encouraged to memorize information rather than understand it, which causes them to not have good scientific literacy. (Mutasam et al., 2021).

Modern human life is very dependent on the ability of scientific literacy. People without scientific knowledge tend to make mistakes, especially in terms of comprehension scientific facts and results. Reasoning based on theory goes a long way in understanding cause and effect and problem solutions, so misunderstanding scientific concepts can lead to bigger problems. According to (Rosyadah Mukti et al., 2019) Scientific literacy is very important. part in science learning, and scientific literacy skills are currently considered a measure of the success of science learning worldwide.

All skills necessary for scientific literacy including providing explanations of scientific phenomena, assessing and constructing science research, and explained science results and data. Scientific literacy refers to collection science-based knowledge and technologies, and students' unique intent, procedure, and outcomes. Scientific literacy does not only include knowledge aboutscientific concepts and ideas, as well knowledge of the procedures and scientific approach inquiry and the process of developing science. All have scientific literacy things related to science, ranging from basics to making important decision regarding general welfare. The ability to use science in everyday life is called scientific literacy (Rosyadah Mukti et al., 2019).

Physics subjects are closely related to students' abilities in scientific literacy. Physics is a field of science where students are asked to think critically when solving problems. Physics is a natural science that studies various natural phenomena. Due to global warming and various other environmental problems, physics is very important to understand environmental conditions(Nova et al., 2021). Therefore, to avoid exploitation or misuse of energy sources that harm the environment, it is very important to understand the principles of physics. Human life depends on a complex environment. Threatened human life will be disrupted if the environment is damaged.

The results of an interview conducted with one of the physics teachers at the research location showed that students were still unable to apply the concept to the questions, most students still did not understand the purpose of the problem, which caused many students to fail to answer questions correctly, and the learning model still dominated by teachers rather than students. The teacher's role is very important in determining the best way to improve students' ability in scientific literacy. Effective learning is one way to improve students' ability in scientific literacy (Sutrisna, 2021). The test results show that many students have difficulty solving scientific literacy questions that are not based on precise physics concepts. These results are in accordance with other studies (Azizah, 2022) which shows that some students reason without using basic concepts when solving problems, which means students only understand concepts without practicing them in real life.

According to earlier research (Indrawati & Sunarti, 2018) "Development of Instruments for Assessment of Scientific Literacy of Students in the Discussion of Sound Waves at SMA Negeri 1 Gedangan Sidoarjo" states that low scientific literacy, researchers are motivated to conduct research, namely developing physics assessment instruments based on scientific literacy, but the instruments developed still have limitations in terms of material and the numeric scale. The study "Analysis of Scientific Literacy Capabilities of High School Students in Sumenep Regency" by Tulaya and Wasis (Tulaya & Wasis, 2020) noted that the study of students' abilities in heat matter has limitations in both material and population, so additional research is needed. it is necessary to use other physics materials and involve a larger population. Additionally, prior research by (Syafri Milanto, Abu Zainuddin 2, 2021) titled "Scientific Literacy Capability Profiles of High School Students in Pamekasan Regency in Static Fluid Material" stated that the research was conducted in analyzing the profile of scientific literacy abilities in static fluid material obtained results that every aspect of competency is still relatively low and sufficient, so additional research is required to determine the participants'.

Based on previous research, researchers updated their analysis of the profile of scientific literacy skills with glasses, specifically global warming and connecting global warming materials with scientific issues in society, and researchers conducted research in areas that were still lacking in knowledge.

The scientific literacy ability profile can be influenced by internal and external factors. The ability of students is an internal factor, and the teacher's learning method is an external factor. The teacher's learning

method can affect the ability of students. Students' initial abilities and students' motivation to learn have an effect, a supportive student environment also has an effect, and vice versa. An unsupportive environment weakens student motivation, which hinders students from solving problems or questions. Therefore, the purpose of this study was to identify the scientific literacy ability profile of SMA Negeri 1 Kepohbaru students.how students solve physics questions about global warming material, and what causes or influences students' scientific literacy abilities.

RESEARCH METHODS

This descriptive research uses quantitative methods. This study involved students who were in class X at SMA Negeri 1 Kepohbaru who had received material about global warming. The technique used is the written test method. The questions in the form of an essay amount to 6 questions that match the criteria for scientific literacy abilities and students' questionnaires to find out what factors or aspects influence.

The stages in the research are research carried out by developing scientific literacy assessment instruments that are in accordance with the indicators used in global warming material and the formulation of scientific literacy questions. The questions made will be tested for validity by two validator lecturers. After the questions are valid, they can be given during research to students totaling 68 students. After carrying out the written test, it is followed by distributing student questionnaires to find out the factors or aspects that influence them. The analysis technique used in this study uses the calculation of student scores by:

$$NP = \frac{R}{SM} \times 100$$

Information:
NP : Percentage Value
R : Score Obtained
SM : Maximum Score

Then the average score for each score obtained is categorized according to the criteria that follow Purwanto's rules as shown in Table 1:

Table 1. Description of Science Literacy Ability Profile

Intervals	Criteria
86%-100%	Very high
76% - 85%	Tall
60% - 75%	Currently
55% - 59%	Low
≤54%	Very low

RESULTS AND DISCUSSION

Data on the percentage profile of scientific literacy skills in class X SMA Negeri 1 Kepohbaru is based on the ability level of students in solving problems. The percentage is made by calculating the number of indicators of scientific literacy ability for each student and comparing it with the ideal score that students should get.

Table 2. Percentage Table Scientific Literacy Ability (KLS) of Students

| KLS indicator	Presentase KLS (%)
K1	52%
K2	40%
K3	31%

Information:
K1 : Competency 1 (aspects of phenomena scientifically)
K2 : Competency 2 (aspects of evaluating and designing scientific investigations)
K3 : Competency 3 (aspect of interpreting data and scientific evidence)

Based on the Table 2, the percentage value of all students for the K1 indicator is 52% in the very low category, the K2 indicator is 40% in the very low category, and the K3 indicator is 31% in the very low category.

The data above shows that the scientific literacy skills of the students of SMA Negeri 1 Kepohbaru are very low. Physics learning still uses a teacher centered approach, which causes most students to get bored when learning in class takes place. This causes students to lack scientific literacy, in line with the idea that teacher-centered schools make students less selective in solving problems. (Beddu, 2019).
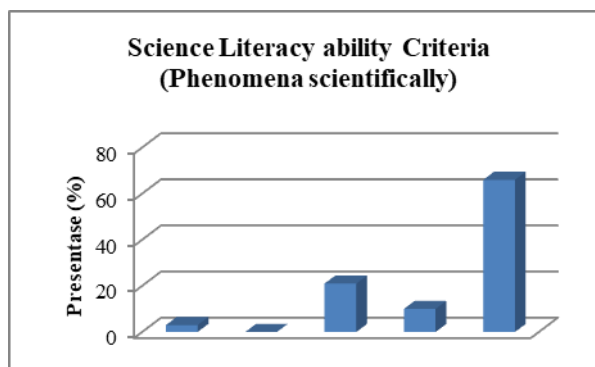
Figure 1. Graph of Scientific Literacy Ability Criteria on indicators of phenomena scientifically
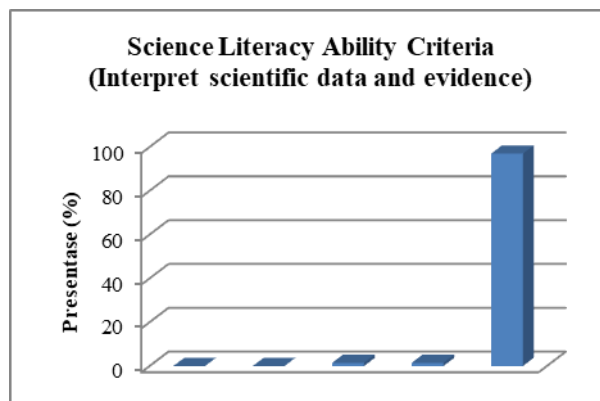
The results of scientific analysis of phenomenon indicators for 2 essay questions are shown in Figure 1. Based on the scientific literacy ability criteria, the average student ability to solve these questions is still

low, namely 52%. A total of 45 students were still in the very low category (66%), 7 students were still in the low category (10%), and only 14 students were included in the medium category (21% of the total students), and no students were included in the high category who had scientific literacy skills to solve physics problems on global warming with scientific phenomena indicators, and 2 students were included in the very high category (66%). The lowest factor In this section, the ability to provide scientific explanations of student phenomena. This is in line with studies (Rahmadani et al., 2022) which shows that the lack of students' scientific literacy skills is caused by the inability to explain phenomena scientifically.
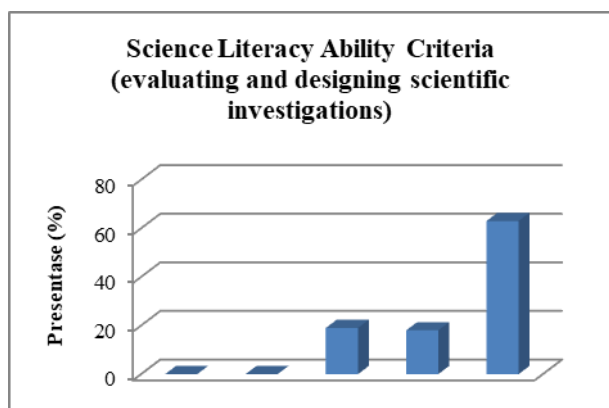
Figure 2. Graph of Scientific Literacy Ability Criteria on evaluating indicators and designing scientific investigation

The results of scientific analysis of evaluation indicators and the design of scientific investigations totaling 1 essay question are shown in Figure 2. According to scientific literacy ability standards, the average student ability to solve these questions is still very low, namely 40%. A total of 43 students were still in the very low category, 63%, 12 students were still in the low category, 18%, and 13 students were still in the medium category, 19%. There are no students who fall into the high or very high category. Students' ability to judge and design in a scientific way research is one of the factors that causes low percentages. It fits the findings of previous research which showed that students' lack of ability in evaluating and compiling scientific research correlated with students' lack of ability in other disciplines. (Lestari et al., 2021).

Figure 3. Graph of Scientific Literacy Ability Criteria on indicators of interpreting data and scientific evidence

Discovery of analysis of data interpretation indicators and scientific evidence for 3 essay questions are shown in Figure 3. According to the scientific literacy ability criteria, the average student ability to solve these questions is still very low, namely 31%. A total of 66 students still in the very low category (97%), 1 student is still in the low category (1.5%), and there are no students who are in the high or very high category. One of factors that cause a low proportion is student ability to understand data and scientific evidence. This is according to research (Arrohman* et al., 2022) who claim that the low level of scientific literacy is caused by students students' lack of understanding of data and scientific evidence.

According to (Jufrida et al., 2019).), internal and external factors affect scientific literacy skills. Students are given an evaluation questionnaire to assess the way the teacher teaches to improve students' skills. The aim is to find out the problem in this research.
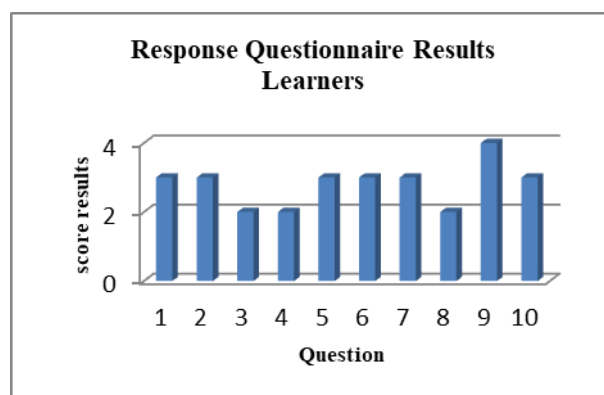
Figure 4. Graph of response questionnaire results learners

The questionnaire contains 10 questions. For internal or internal factors, it consists of 5 questions that explain how the teacher teaches. The criterion value is from 1 (very good) to 4 (very good).

The first question, or number 1, determines the level of students' thinking to understand the material. According to the results of the questionnaire, educators convey the material well and is simpler. The second question, or number 3, determines the level of students' understanding of the material simply by memorizing formulas. As shown by the results of the questionnaire, students are only given formulas without getting a deeper understanding of the material.

In question number 7, which asks about how the teacher allows students to think from various perspectives, The results of student responses are considered good, which shows that the teacher helps students think about physics problems related to global warming from different perspectives. Furthermore, in question number 9, which asks about how the teacher encourages students to solve problems with 5M, student response survey results get a good category, indicating that the teacher helps students.

External factors consist of five questions: question number 2 asks the teacher's reason for doing the assignment, the test activity, and the purpose for doing it. The results of the student response questionnaire showed that the teacher had explained well the reasons for giving assignments, tests, and other activities. Question number 4 asks how the teacher poses questions, problems, and helps students. In question number 4, about how the teacher creates questions, problems, and helps students find relevant information to answer questions, the results of the questionnaire show that student respondents have sufficient categories. These results indicate that the teacher has provided sufficient assistance to students in finding solutions to problems.

Question number 6 asks about how the teacher helps students in making data conclusions and helps students actively ask questions. Questionnaire results about student responses showed that the teacher did well in making data conclusions and helping students actively ask questions. Question number 8 asks about how students evaluate opinions related to problems, formulates problems, makes hypotheses, and makes conclusions. In addition, from question number 10 about how teachers teach so students can analyze statements and interpret correctly based on available data, the results of the questionnaire students give good grades. This shows that the teacher has done a good job of helping students evaluate the data and assess the evidence to make conclusions.

As shown by the results of the student response questionnaire, students have provided sufficient responses about the teacher's learning methods. However, some students indicated that the teacher had given good or very good responses. Thus, the percentage results are in the medium category because the teacher failed optimally in teaching students' scientific literacy abilities. Research (Nuraida, 2019) also shows that it is very important for teachers to prohibit scientific literacy to their students properly. Students' initial ability greatly influences their ability in scientific literacy. This is in accordance with research (Jofi Kuswanto et al., 2021) which shows that initial abilities are very important for success in education and getting better learning outcomes, critical thinking skills.

CONCLUSION

The results show that students in class X SMA Negeri 1 Kepohbaru have very low ability to understand and read science.The factors that influence students' scientific literacy abilities to solve physics problems are as follows, teacher behavior during the learning process that is lacking in providing guidance to students in working on questions, giving questions to students which mostly focus on one aspect of scientific literacy, students' interest in physics is lacking, and students' learning habits when given physics questions. This research is limited to the 2018 PISA competency profile related to global warming for scientific literacy. The findings of this study may be related to students' scientific literacy abilities which are still low. Therefore, it is hoped that by studying more learning and evaluation instruments, especially in the field of physics, it will be able to increase students' scientific literacy capacity. xxx

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