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Relationship Between Scientific Literacy and the Ability to Solve Environmental Pollution Problems

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Abstract: Problem of environmental pollution is a challenge for all living things on earth. One effort that can be made to increase environmental awareness is through education. One of the agents who can be involved in overcoming various existing environmental problems is students. In order to support students' ability to solve environmental pollution, it is important to be able to involve their scientific literacy. This research is a quantitative descriptive study using a survey method conducted at 2 high schools in the Jakarta area, involving a total of 197 class XI Science students. The data used in this research includes the results of scientific literacy tests and tests of students' environmental pollution problem-solving abilities. Data testing in this research includes normality, homogeneity, and linearity for correlational and regression analysis. Based on the results of the research conducted, it can be concluded that there is a positive correlation between scientific literacy and students' ability to solve environmental pollution problems. Based on these results, the implication in this research is that students' problem-solving abilities can be improved through strong scientific literacy.

Keywords: scientific literacy, problem-solving abilities, environmental pollution.

▪ INTRODUCTION

Problem-solving is essential in the 21st century, both in learning and everyday life. Various problems exist around humans, and we must solve them. Each individual needs to have problem-solving abilities to find solutions to these problems. The better the individual's ability to solve problems, the better the problem-solving that can be done. There are various kinds of issues in Indonesia, one of which is problems related to the environment.

Environmental problems are a serious challenge that some people are still unaware of. The environment has a very significant role in human life. The problem of environmental pollution is a challenge for all living things on earth. The context of environmental management has anthropocentric ideas. This refers to the assumption that humans with various interests have the most significant role in ecosystem structure and policy-making related to environmental management (McNew-Birren and Gaul-Stout, 2022). This has an impact on the emergence of a resource management model that is exploitative and only focuses on human profits.

Environmental pollution is one of the numerous issues that fall under the umbrella of environmental problems. Environmental pollution is a phenomenon that occurs when the physical and biological components of the earth's system and atmosphere experience pollution, which, of course, can disrupt the balance of the

environmental ecosystem. This also concerns changes in the composition of water or soil caused by human actions and natural processes so that the quality of the water or air is no longer suitable for its intended purpose or cannot function properly. Substances that can cause environmental pollution and threaten the survival of living things are called

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pollutants. These pollutants can be chemicals, dust, sound, radiation, or heat that enter the environment (Widodo and Fida, 2016).

There are various kinds of environmental problems that occur in Indonesia. Mining activities cause environmental problems, both licensed and illegal, as well as oil palm plantations that have cleared thousands of hectares of forest, which function to absorb rainwater. Referring to data from research conducted by Hinostroza et al (2024), it is said that around 14 million hectares of forest have changed function. Meanwhile, data from the Ministry of Agriculture and Plantation of the Republic of Indonesia for 2023 states that the number of palm oil plantations has reached 8,420,263 hectares.

Citing data from the European Commission, Indonesia's greenhouse gas emissions volume in 2022 will reach 1,240.8 million tonnes of carbon dioxide equivalent (Mt CO2e), or 1.24 gigatons of carbon dioxide equivalent (Gt CO2e) (Lederman et al., 2024). This figure is equivalent to 2.3% of total global greenhouse gas emissions, making Indonesia the country that produces the most emissions in Southeast Asia. For example, the temperature in 2023 will be the hottest in history and has reached an increase of 1.5 degrees Celsius, or the threshold of the Paris Agreement target. It is almost certain that in 2024, this temperature increase will exceed 1.5 °C. The shift in the rainy season in Indonesia by three months and crop failures were caused by extreme weather in various regions. This is proof that the climate crisis is right before our eyes and needs serious handling.

Another environmental problem is waste, which is still one of the challenges that must be solved immediately in Indonesia. Waste from human activities is increasing in volume along with growing population, consumption levels, and technological advances. Based on data from the Ministry of Environment and Forestry's National Waste Processing System (SIPSN), as of July 24, 2024, national waste stockpiles from 290 districts/cities reached 31.9 million tons (Suwono et al., 2023). This is certainly something that needs to be followed up in depth so that a suitable solution can be found.

Participation from all parties is needed to solve existing environmental pollution problems from the government and society. This participation from related parties can be used to solve existing environmental pollution problems (Čipková et al., 2018). One effort that can be made to increase environmental awareness is through education. Referring to the results of the Tblisi Convention, the aim of education involving the environment is to provide knowledge and experience to students in sustainably protecting the environment so that it will create awareness and encourage motivation to be able to actively participate in improving and protecting the environment (Guo & Cheng, 2019). Therefore, students need to be involved in environmental education to be actively involved in various issues related to environmental pollution.

Environmental education is an integral part of global efforts to strengthen students' awareness and social responsibility towards the environment (Ploj Virtič, 2022). In a modern era filled with environmental challenges such as climate change, biodiversity loss, and environmental pollution, the younger generation needs to understand the impact of their actions on the planet. One is the impact of all their activities on the environment.

Environmental education aims to integrate knowledge, skills, attitudes, and sustainability values into the educational curriculum. Through experience-based and interactive learning, students not only learn about environmental problems but are also

invited to develop critical, collaborative, and creative thinking skills by solving various existing environmental pollution problems (Iddy et al., 2024).

The ability to solve environmental pollution problems is an individual's ability to find solutions to issues related to pollution of the physical and biological components of the earth's system and the atmosphere, which can disrupt the environmental balance of the environmental ecosystem. To solve a problem, an individual must have four primary abilities, namely: understanding the problem, planning a solution, resolving the situation, and reviewing all steps that have been taken related to solving the problem being carried out (Roesch et al., 2015).

The results of research conducted by Nurjanah (2019) stated that students' problem-solving abilities were still relatively low based on the test results. This was analyzed from the test results, which showed that students still had difficulty in completing questions in the form of analysis, synthesis, and evaluation. Based on research conducted by Sigit et al (2017), students' low ability to solve environmental pollution problems is primarily due to their low level of knowledge. So it can be concluded that the lack of knowledge possessed by students has an impact on students' low ability to solve various kinds of problems related to environmental pollution.

According to Siagian et al (2017), to be able to hone the knowledge possessed by students to support their ability to solve various kinds of environmental pollution problems, scientific literacy skills can be an alternative. Scientific literacy is essential for every individual, considering that the development of science and technology requires awareness, insight and attitudes that are integrated with scientific knowledge (Glick and Greenberg, 2017). Based on this, it can be concluded that to increase the knowledge possessed by students to support their ability to solve environmental pollution, they need good scientific literacy.

According to the Program for International Student Assessment (PISA), scientific literacy is defined as an individual's ability to use scientific knowledge, identify problems, and build conclusions based on scientific evidence regarding current scientific issues. This is done to understand and make decisions regarding the relationship between humans and nature and human activities towards nature (OECD, 2022).

The definition of scientific literacy often changes according to changing times. In general, scientific literacy is defined as understanding and knowledge of scientific concepts and processes needed to make decisions, participate in civil and cultural affairs, and ultimately increase economic productivity (Wulandari, 2016). Another opinion defines scientific literacy as a person's ability to utilize scientific knowledge, recognize questions, and draw conclusions based on evidence to understand and make decisions involving the universe and natural changes influenced by human activities. (Hartati, 2016).

Education from elementary school to university level generally goes through a literacy process, especially in the context of science learning. Scientific literacy comes from the word "literatus," which means letters or education, while "Scientia" means knowledge. Literacy has the connotation of a movement against illiteracy. Meanwhile, the term science comes from English, which means knowledge. According to the National Science Teacher Association, a person is said to have scientific literacy if he can apply scientific concepts and has skills in the scientific process. This ability allows individuals to make daily decisions in interacting with other people and the environment and

understand the relationship between science, technology, and society, including social and economic development (Asyhari, 2015) .

The evaluation assessment produced by the Program for International Student Assessment (PISA) in 2022 shows that in the category of scientific literacy ability, Indonesia is ranked 67th out of 81 participating countries (OECD, 2022). Data from the PISA survey results show that students' scientific literacy in Indonesia is still in the low category. This, of course, requires a deeper review to be able to find the cause and the right solution to the problem. Several factors can explain the low level of scientific literacy in Indonesia, such as students' low understanding of the essence of science, inability to apply scientific concepts in everyday life, and limited understanding of science to only theoretical aspects (Sopandi, 2019). This impacts acquiring knowledge; students focus more on memorizing the knowledge than understanding existing concepts. This is in line with the results of research conducted by Erniwati et al. (2020) at SMAN 1 Kendari, which states that the low level of scientific literacy possessed by students will have an impact on students' lack of mastery of basic concepts in answering questions. So this results in the emergence of misconceptions or simply memorizing, which can be easily forgotten.

According to Ristanto et al (2017) , having good scientific literacy among students will positively impact students' mastery of basic concepts so that they can later help during the learning process. One of these is related to materials related to environmental pollution. This research chose material on ecological pollution because it is often considered easy by students, even though, in fact, literacy and mastery of concepts that are quite good are needed to solve and resolve environmental pollution problems. In this way, students will later be able to produce ideas related to understanding ecological pollution and be able to answer and solve various types of issues given.

This research aims to analyze the relationship between scientific literacy and students' problem-solving abilities. Researchers have previously conducted a literature review to establish a positive hypothesis, namely that there is a relationship between scientific literacy and students' ability to solve environmental pollution problems.

▪ METHOD

Participants

The population in this research was selected using a multistage random sampling approach with several stages. The first stage used a purposive sampling technique to choose two state high schools in South Jakarta. Election these two schools because this school still has classes that take biology, physics, and chemistry specializations simultaneously without being separated, while other schools have started to map courses according to students' study majors. The second stage was to determine the classes taken, namely 3 out of 9 classes XI at SMA A and 3 out of 10 classes XI at SMA B, with 217 students using cluster random sampling. The third stage was determining the research sample using simple random sampling techniques, and 197 students were selected.

Research Design and Procedures

This research is a quantitative descriptive approach. This research was carried out using regression and correlational analysis methods. Two primary data are obtained through scientific literacy test score data and students' ability to solve environmental

pollution problems in the form of quantitative numbers for statistical analysis. This research refers to one independent variable and one dependent variable. The independent variable (X) is scientific literacy, and the dependent variable (Y) is the ability to solve environmental pollution problems.

The research procedure begins with designing and developing a scientific literacy test and a test of the ability to solve environmental pollution problems for students based on a predetermined conceptual framework. After that, the test is distributed to a sample of students determined randomly or through systematic selection. While filling out the test, students are asked to answer questions regarding scientific literacy and the ability to solve environmental pollution problems that will measured. The collected data is then analyzed using statistical methods, such as descriptive analysis, to get an overview and inferential analysis to determine the influence between the variables studied. The following image illustrates how this research procedure was carried out.

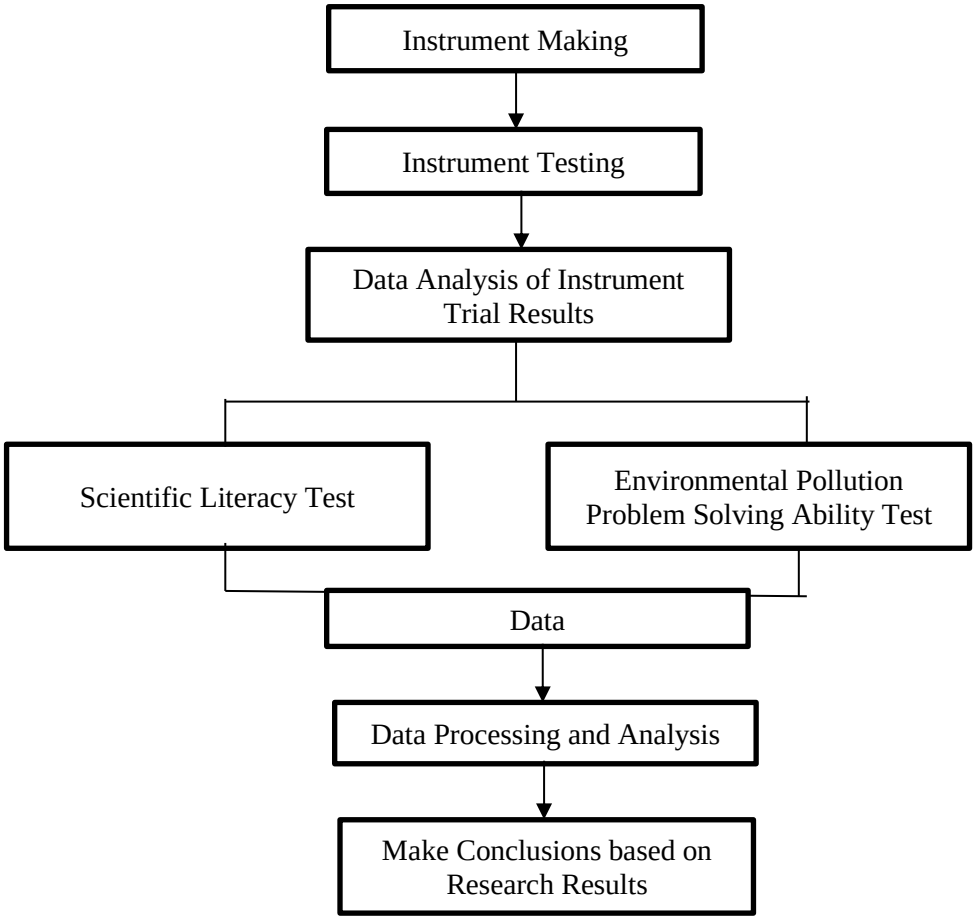


Figure 1. Research procedures

Instrument

Sample collection in this research was carried out using a test instrument consisting of 25 questions referring to the PISA dimensions, which are used to measure students' scientific literacy abilities. Meanwhile, problem-solving ability was measured using 28 test instrument questions regarding Gregor Polya's dimensions. The type of question used

in this research instrument is essay. The test method using essay questions was chosen because it aims to provide flexibility for students in conveying their ideas based on reading sources and information contained in the questions. The test questions were created by involving a lot of information contained in articles about environmental pollution in Indonesia, which aims to increase students' sources of information.

Before data collection was carried out, the two instruments were first tested for validity and reliability. Validity testing is carried out content and empirically. The content validity test was carried out by two experts from lecturers in education and biology. Apart from conducting content validity, this research also conducted empirical validity tests involving 34 class XI students. Based on this test, it was stated that of the 25 scientific literacy instrument questions that had been created, there were 18 valid scientific literacy test questions with a reliability value of 0.845.

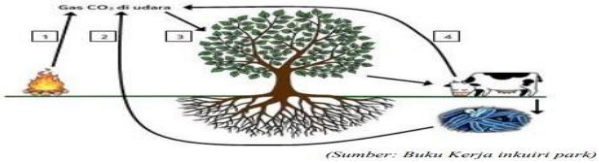
The instrument used to determine students' scientific literacy is in the form of questions about science issues in essay format. Students' scientific literacy is measured using test questions that refer to the three indicators proposed by PISA. The questions were created and developed with reference to the three dimensions of PISA among others are scientific process, the context of the application of scientific knowledge, and scientific knowledge. The grid of scientific literacy can be seen in Table 1.

Table 1. Indicators of measuring scientific literacy

NO	Dimensions of Scientific Literacy	Indicator	Indicator Description	Number of Questions
1.	Science Process	Explain scientific phenomena	The process of explaining events or circumstances that can be observed and assessed scientifically.	4 question
		Interpretation data and scientific evidence	Ability to analyze and evaluate information, statements, and arguments in various ways representation and determine conclusions appropriate.	3 question
		Evaluate and design investigations	The ability to structure, assess, and evaluate scientific investigations and how to answer scientific questions and interpret data.	3 question
2.	Science Application Context	Personal environment	Skills that a person acquires from the environment and daily activities.	2 question
3.	Science Knowledge	Content knowledge	Knowledge that contains theories, facts, ideas, or information.	4 question
		Procedural knowledge	Knowledge of variables and data interpretation.	2 question

Table 2. Examples of scientific literacy questions for each indicator

Indicator	Example Questions
Explain scientific phenomena	A methane molecule (CH_4) produces 23 times the heating effect of a CO_2 molecule. N_2O molecules even produce a heating effect up to 300 times that of CO_2 molecules if City X is an industrial factory area while City Z is a cattle breeder area. Based on the information above, the

	predicted consequences if each city produces the same number of molecules are...
Interpretation data and scientific evidence	Bela lives in the highlands. At any time, he can see the beautiful mountain views directly. When he first lived in his house several years ago, every morning, he felt cold because the area was often covered in fog. But recently, he often felt hot and rarely saw fog covering the surrounding area. This is because residential areas have replaced the green land in the environment around his house. To overcome Bela's problem and reduce the impact of global warming, Bela will increase the number of trees around her house. The most appropriate reason for Bela's solution is...
Evaluate and design investigations	Observe the diagram below!  (Sumber: Buku Kerja inkuiri park) The diagram shows carbon dioxide gas used or released in several processes. The correct pair of four processes in the diagram above is...
Personal environment	Burning fossil fuels (especially in vehicle engines and power stations) causes the formation of acidic gas pollutants such as sulfur dioxide and nitrogen dioxide. After the gases are released into the air, they react with rainwater, causing it to become acidic (acid rain). If this acid rain occurs continuously, it can cause quite severe corrosion to metal, such as what happens to house fences. In highly polluted environments, fences made of iron will corrode more quickly than fences in unpolluted environments. Give your opinion on why this might happen. What factors influence it when it comes to reaction rate?
Content knowledge	A city has bus A, which, like most buses, is powered by a petrol engine. These buses have an impact on environmental pollution. Some towns have B buses, which are powered by electric motors. The voltage required for such an electric machine is provided via an overhead line (such as an electric train). Electricity is supplied by power plants using fossil fuels. People who support using B buses in the city say that these buses do not affect environmental pollution. Is this statement true? Explain!
Procedural knowledge	Some motor vehicle drivers often use retail petrol when they run out of petrol, especially during an emergency. However, consumers should be careful about contaminated gasoline that can damage motor vehicle engines. Mixed gasoline is a type of gasoline mixed with other liquids, such as kerosene. Pure gasoline can be differentiated from blended gasoline by its characteristics and properties. Pure gasoline has colors; for example, Pertalite is green, Pertamax is blue, and Pertamax Turbo is red. Pure gasoline has volatile properties and does not contain contamination from other substances. Write a research design that includes tools, materials, and work procedures to differentiate pure gasoline from adulterated gasoline in terms of the presence or absence of sediment!

This problem-solving ability test was developed using environmental pollution material with reference to Gregor Polya's 4 indicators of problem-solving ability (Polya, 1985). There are 24 problem-solving ability questions fall into the valid criteria with a reliability value of 0.864. Gregor Polya developed four indicators: understanding the problem, making a problem-solving plan, implementing the plan, and checking answers again. The grid of environmental pollution problem-solving abilities can be seen in Table 3.

Table 3. Indicators of measuring problem-solving abilities

NO	Problem-Solving Ability Indicator	Indicator Description	Number of Questions
1.	Understand the problem	Ability to determine what is known and what is asked in a problem.	6 question
2.	Create a problem-solving plan	The ability to search for answers and explanations of a problem by choosing alternatives that are considered correct or close to the truth.	6 question
3.	Implementation a problem-solving plan	Ability to organize steps in the problem-solving process aimed at carrying out the plan that has been designed.	6 question
4.	Double check answers	Ability to ensure the correctness of the answers or planning results that have been obtained.	6 question

Table 4. Examples of problem-solving ability questions for each indicator

Read the information below!

The water quality of the Cikapundung River continues to worsen. In the rainy season, it becomes very cloudy because it contains colloids and suspended solids from erosion in the northern area. Likewise, sedimentation is increasing and shallowing the river that divides the city of Bandung. The biggest influence is the development of Punclut, even though the governor declared the area a protected area.

Indicator	Example Questions
Understand the problem	What can you understand from this problem?
Create a problem-solving plan	What can you plan to do to solve this problem?
Implementation a problem-solving plan	What can you do to solve this problem?
Double check answers	Recheck your answers and conclude what you understand about the problem based on theory!

Data obtained from scientific literacy tests and problem-solving abilities in the form of student answers obtained will later be corrected according to the assessment standards that have been created. That is, for each question item, students get a score of for if they can answer according to the answer keywords, three if the answer does not match the answer keywords, and two if they can answer cause and effect, which is still related to the question but does not match the keywords, get a score of 1 if the answer is wrong, and

0 if you don't answer at all. After the correction is carried out, the data will be analyzed to categorize the students' scientific literacy scores and problem-solving abilities by adding up the scores obtained by all students in each school and then converting them into percentages.

Data Analysis

Data analysis techniques used in this research are descriptive statistics and inferential statistics. Descriptive statistics are used to analyze data by describing or illustrating the data that has been collected as it is. Meanwhile, inferential statistics allows researchers to provide descriptions and conclusions from the data obtained. Inferential statistics includes two tests, namely analysis prerequisite tests and hypothesis tests. The prerequisite tests for analysis in inferential statistics include normality tests and homogeneity tests. After the prerequisite tests for analysis in this research have been fulfilled and meet all the requirements, the hypothesis testing technique used is multiple linear regression. Multiple linear regression analysis is a study of the dependence of a dependent variable (dependent variable) on one or more independent variables (independent variables) to estimate or predict the average of the dependent variable based on the known values of the independent variables. After carrying out the multiple linear regression test using the F test, a multiple correlation test was carried out using the t-test. Finally, the coefficient of determination (R2) test measures how far the model can explain variations in the dependent variable.

▪ RESULT AND DISSCUSSION

Result and Discussion

The research results obtained after processing the four variables are shown in Table 5. There is descriptive data, including mean, median, mode, minimum and maximum scores, range of scores, standard deviation, and data variance. More complete data can be seen in Table 3 below:

Table 5. Summary of research descriptive statistics

Statistical Measures	Scientific Literacy	Problem-solving Ability
Average	85.07	87.58
Median	85	88
Modus	85	88
Standard Deviation	4.92	4.13
Variance	24.27	17.08
Lowest Value	74	78
Highest Value	96	96
Total Score	16.759	17.254

Descriptions of the scores for the four variables are presented sequentially, starting from scientific literacy and ability to solve environmental pollution problems. Table 5 shows that the highest value of scientific literacy is 96, and the highest value of problem-solving ability is 96. The lowest value of scientific literacy is 74, and the weakest of problem-solving ability is 78. The average value of scientific literacy is 85, and the ability to problem-solve amounted to 87. The frequency distribution data for scientific literacy and problem-solving abilities can be seen in the diagram below:

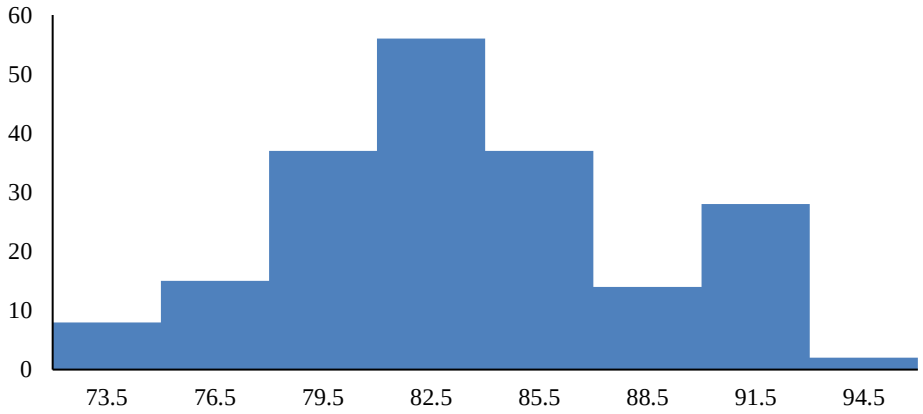


Figure 2. Frequency distribution of scientific literacy

Based on figure 2, the highest frequency of scientific literacy scores was in the class interval with a score of 82.5 - 85.5, namely 56 students with a relative frequency of 28%. Meanwhile, the lowest frequency of scientific literacy scores was in the interval 94.5 - 96.5, namely two students with a percentage of 1%.

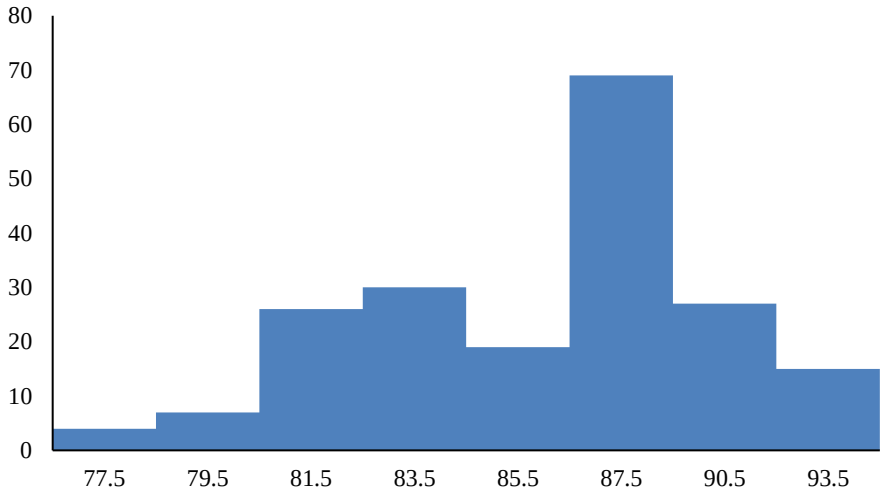


Figure 3. Frequency distribution of problem-solving ability

The highest frequency distribution was in the sixth interval class, 69 students (35%), while the lowest frequency was in the first interval class, 4 students (2%). The frequency distribution of students' environmental pollution problem-solving abilities is displayed in the histogram graph in Figure 3. On average, the acquisition of scientific literacy and the ability to solve environmental pollution problems in this study is good because it is above 80. This is because the sample for this study was taken from class XI, who studied the same physics, chemistry, and biology material. So from a scientific concept, students have adequate knowledge of science that can be used to solve environmental pollution problems.

In line with research conducted by Anagün (2018), the material on environmental pollution discusses environmental problems that are, of course, contextual in nature, such as the problem of polluted rivers, air pollution, and a large amount of inorganic waste. Discussions related to this matter are studied in natural sciences. IPA is an acronym for natural science, namely the study of the natural environment and its contents. This means that science studies all objects that exist in nature, events and symptoms that appear in nature (Eden, 2024). One group of natural sciences that are related to each other is physics, chemistry, and biology.

Environmental pollution is a material studied in biology (Garthwaite et al., 2014). However, environmental pollution is not only related to biology but is closely related to physics and chemistry. For example, water pollution in an environment is characterized by the death of fish and animals in the water area. After conducting research, it turned out that the water was polluted because it contained dangerous chemicals caused by waste. This results in physical changes in the water area, such as the water becoming cloudy and emitting an unpleasant odor.

The statement above concludes that discussing a case of environmental pollution also involves points of view from three disciplines. Physical changes that occur in polluted water areas are studied in physics. The chemical content of waste that pollutes water areas is studied in chemistry. And its impact on the death of other living creatures in these waters is studied in biology (Gizaw and Sota, 2023).

After descriptive statistical tests have been carried out, the next step is to conduct descriptive analysis. The descriptive analysis used in this research uses normality, homogeneity, and hypothesis testing using regression, correlation, and coefficient of determination. Normality testing was carried out using the Kolmogorov-Smirnov test. The testing criteria carried out in this research used a significance level of α: 0.05. Based on the results of the normality test calculation of the ability to solve environmental pollution problems on scientific literacy, a significance value of 0.285 > 0.05 is obtained, which means the data is normally distributed.

Testing for homogeneity of variance was carried out using the Bartlett test. The degree of decision-making is that H0 is accepted if the significance value obtained is greater than α: 0.05. Based on the results of tests carried out using the Bartlett Test, the variance of the ability to solve environmental pollution problems on scientific literacy obtained a significance value of 0.927, where this value is greater than the significance level of 0.05, which means considered homogeneous.

Analytical requirements testing that has been carried out is declared to meet the requirements for further statistical tests to be able to perfect the hypothesis testing carried out. As previously written, the hypothesis contained in this research is that there is a positive relationship between scientific literacy (X) and the ability to solve environmental pollution problems (Y). As for the data obtained from the results of simple linear regression analysis calculations on data X on Y, the constant a = 70.358 and the regression coefficient b = 0.217 were obtained (Table 6).

Value of constant (a) has a positive value of 70.358, which means it shows the unidirectional influence of scientific literacy on the ability to solve environmental pollution problems. This shows that if the variable for scientific literacy is 0 percent or there is no change, then the value of the ability to solve environmental pollution problems is 70.358. The value of the regression coefficient for the scientific literacy variable has a

Table 6. Calculation results of the simple linear regression model between X1 and Y

Coefficient						
Model		***Unstandardized Coefficient***		***Standardized Coefficient***	**t**	**Sig.**
		B	**Standar Error**	**Beta**		
1	(Constant)	70.358	4.90		14.35	.00
	Scientific literacy	.217	.06	.24	3.52	.00
a. Dependent Variable: Problem-solving						

positive value of 0.217. This shows that if the variable of scientific literacy increases by 1%, students' ability to solve environmental pollution problems will also increase by 0.217. This shows that there is a unidirectional influence between the independent variable and the dependent variable. The equation of the simple linear regression model is Ý = 70.358 + 0.217X + e. Based on the results of the equation that has been obtained, it shows that if there is an additional 1 score in scientific literacy, then the score for the ability to solve environmental pollution problems will increase by 0.217 at a constant of 70.358.

Table 7. Results of the significance test of the simple linear regression model between X and Y

ANOVA						
Model		**Sum of Squares**	**df**	**Mean**	**F**	**Sig.**
1	Regression	199.994	1	199.994	12.38	.001
	Residu	3147.874	195	16.143		
	Total	3347.868	196			

Results of the significance test of the regression model at a significance level of α = 0.05 show that the Fcount produced in the test is 12.38, which is a value greater than the Ftable in this study which has a value of 3.04 with a significance value of obtained is 0.001, which means that the value is smaller than the significance level of (0.05) and means that H0 is rejected. This shows that the scientific literacy variable and students' ability to solve environmental pollution problems using the simple linear regression model Ý = 70.358 + 0.217X + e is significant.

Calculating the correlation coefficient using the Pearson Product Moment formula, we know that the correlation coefficient between scientific literacy and the ability to solve environmental pollution problems is 0.875. This certainly illustrates a positive correlation with robust criteria between scientific literacy and students' ability to solve environmental pollution problems.

These results align with the research conducted by Özenc and Çarkit (2021), which stated that there is a robust correlation between the scientific literacy possessed by students and their ability to solve problems. This is because when students have good scientific literacy, students will have richer knowledge and information. The knowledge

information that students have will later be helpful for students in solving various kinds of problems they encounter in everyday life.

Based on the results of the calculations that have been carried out, the value of the coefficient of determination between scientific literacy and the ability to solve environmental pollution problems is 0.276. As for the value obtained from the coefficient of determination, it can be interpreted that the variable from scientific literacy contributes to problem-solving abilities, namely 27.6%, while the remaining 72.4% is caused by other factors.

The contribution of scientific literacy to the ability to solve environmental pollution problems is 27.6%, while other factors cause the rest. Referring to research conducted by Muhibbuddin et al (2019), students' problem-solving abilities can be sharpened; one way is by using a HOTS-based learning model and through problem-based learning (Problem-Based Learning). As educators, teachers have several strategies to improve students' problem-solving abilities. Wrong One way is to choose a learning model that encourages active student participation, such as problem-based learning. Teachers can also adopt approaches and technology to improve students' problem-solving abilities (Yacoubian, 2018). Problem-Based Learning (PBL) be a very appropriate learning approach for mathematics at all levels of education, both elementary and university. Through PBL, students are encouraged to develop critical and analytical thinking as they attempt to solve given mathematical problems. By using real-world or contextual context in learning, PBL helps students see the relevance of mathematical concepts in everyday life while also improving student involvement in the learning process (Mun et al., 2015).

The application of Problem-Based Learning (PBL) can differ for each level of education. Differences may occur in the context of the problem presented, the level of teacher involvement, problem complexity, collaboration between students, and evaluation methods. At the elementary level, issues are possibly more straightforward and in line with children's everyday experiences. In contrast, in middle and high school, problems can be more complex and require more abstract thinking. The role of the teacher may be more direct in elementary school, while in middle and high school, teachers can act as facilitators (Klucevsek, 2017).

Apart from that, based on the results of research conducted by Kähler et al (2020), students' problem-solving abilities can also be influenced by the psychological aspect of self-efficacy. Self-efficacy is considered a tool for assessing success in solving problem-solving questions, which means that the higher the self-efficacy a student has, the better their ability to solve a problem.

A scientific literacy test was created involving three sciences related to environmental pollution, namely physics, chemistry, and biology. This is by research involving samples from class XI high school who were included in biology, physics, and chemistry classes. So, the material involved in the questions is quite familiar to students because most of this material has been studied in class. So, based on the research results, many students obtained grades in the good category.

This is proven by the results of the Pearson Product Moment of scientific literacy, which shows the ability to solve environmental pollution problems, showing tremendous results with a perfect positive correlation. This indicates that the higher the students' scientific literacy, the more they will contribute to improving the students' problem-solving abilities. Likewise, if students have low scientific literacy, this will contribute to

their problem-solving skills. This aligns with research conducted by Norris and Phillips (2003), which states that good scientific literacy is very important for students because it contributes quite highly to students' ability to solve problems.

▪ CONCLUSION

Based on the hypothesis testing carried out in this research, it can be concluded that there is a positive correlation between the scientific literacy possessed by students and their ability to solve problems. Developing scientific literacy possessed by students can help in analysing data and making science-based decisions, so that they can increase students' ability to solve various kinds of environmental pollution problems. There is an implication in this research, namely that students' problem-solving abilities can be improved through strong scientific literacy. Therefore, it is important for teachers and schools to pay attention to and develop further the scientific literacy of students. Scientific literacy assessment can be done by developing questions that cover content, process, and application. This allows teachers to find out how far students have developed their scientific literacy skills.

Based on the research, suggestions can be given, including for schools and teachers to involve learning that can hone scientific literacy and students' problem-solving abilities, especially those related to environmental pollution because environmental issues are closely related to human survival. And in the future, students can be more enthusiastic about honing their literacy and increasing their insight so they can contribute to solving problems in the surrounding environment. This research only discusses the relationship between scientific literacy and the ability to solve environmental pollution problems using survey methods, so suggestions for future researchers can explore more deeply what can improve students' scientific literacy and problem-solving abilities, such as learning methods and learning models that can influence the effectiveness of these abilities.

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