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Estimating the Impact of Science Literacy Ability towards Problem Solving Ability of Junior High School Students

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Abstract: Science learning has concepts related to phenomena that occur in nature. Therefore, students must be able to understand science in its entirety with scientific literacy activities and students will be able to learn science more easily by increasing their problem-solving abilities. This study aims to determine whether or not scientific literacy has an effect on problem solving abilities. This research is an experimental research with simple linear regression analysis method. Using class 8 odd semesters with a total of 29 students and the tests used are scientific literacy tests and problem solving tests. The result of this research is that the highest scientific literacy criteria is sufficient criteria with a percentage of 57.14% and indicators identify valid scientific opinions with the highest percentage. Meanwhile, in problem solving ability, the highest criteria are very good criteria, namely 62.06% and the highest indicator is an indicator of understanding the problem. Regression analysis stated that the significance value was 0.000 <0.05. Thus, there is an influence of scientific literacy (X) on problem solving ability (Y).

Keywords: Scienctific literacy, problem solving ability, simple linier regression.

Abstrak: *Pembelajaran IPA memiliki konsep yang berhubungan dengan fenomena yang terjadi di alam. Oleh karena itu, siswa harus dapat memahami IPA secara utuh dengan kegiatan literasi sains dan siswa akan dapat lebih mudah belajar IPA dengan lebih meningkatnya kemampuan pemecahan masalah yang dimiliki siswa. Penelitian ini bertujuan untuk mengetahui ada pengaruh atau tidak literasi sains terhadap kemampuan pemecahan masalah. Penelitian ini merupakan penelitian eksperimen dengan metode analisis regresi linier sederhana. Menggunakan kelas 8 semester ganjil dengan jumlah 29 siswa dan tes yang digunakan adalah tes literasi sains dan tes pemecahan masalah. Hasil dari penelitian ini adalah terdapat kriteria literasi sains paling tinggi adalah pada kriteria cukup dengan persentase 57,14% dan indikator mengidentifikasi pendapat ilmiah yang valid dengan persentase paling tinggi. Sedangkan pada kemampuan pemecahan masalah kriteria paling tinggi adalah kriteria sangat baik yaitu 62,06% dan indikator paling tinggi adalah indikator memahami masalah. Hasil analisis regresi menyatakan bahwa nilai signifikansi sebesar 0,000<0,05. Dengan demikian, maka terdapat pengaruh literasi sains (X) terhadap kemampuan pemecahan masalah (Y).*

Kata kunci: *literasi sains, kemampuan pemecahan masalah, regresi linier sederhana.*

▪ INTRODUCTION

Natural Sciences deals with everything that is in nature to be studied by humans. Science is a systematic way to find out about nature and is not just knowledge of concepts and principles but is a process of discovery through experimentation (Lusidawaty & Vivi, 2020). In accordance with research (Setiyawan, 2021) which states that science studies natural phenomena with a series of scientific processes that are carried out carefully to be studied. Therefore, science becomes a science that is learned by applying scientific concepts that are observed directly in nature and its application in

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everyday life (Nuraini & lailatul. 2022). Therefore, it is important to be taught in science learning at every level of education.

Science learning is carried out at every level of education that is passed by students. This is because science learning in the learning process carries out self-discovery activities about facts, concepts, and theories that occur in the natural surroundings (Suryanda, 2021) and students can apply them in their daily lives. Research (Gusti, 2020) states that science learning studies phenomena in terms of objects, problems, themes and places of occurrence, so that it becomes a collection of theories that have been tested for their validity and regularity through the process of observing natural phenomena around them. Therefore, science learning must apply scientific literacy and problem solving skills.

Scientific literacy is increasingly being carried out at every level of education that exists in the current era. Literacy is often referred to as literacy and science is defined as knowledge. Scientific literacy is the ability of students to use knowledge about science, identify questions that arise and be able to draw conclusions based on scientific evidence that exists in nature and natural changes that occur through human activities (Pertiwi et al, 2018). The policy regarding science education is that the goal of science education is to create a young generation who can be scientifically literate so that students can achieve scientific literacy skills (Narut & Kanisius, 2019) and not only know that literacy is just reading but scientific literacy is also included in identifying and drawing conclusions from the scientific evidence. According to (Pratiwi, 2019) which states that scientific literacy uses a scientific way of thinking by being able to address and resolve social science issues that are obtained by students. Therefore, students' scientific literacy will help students in carrying out scientific thinking processes so that they can have problem solving abilities.

Problem solving ability is an essential and fundamental ability that must be possessed by students. In accordance with the research of Mariam, et al (2019) which states that problem solving ability is a fundamental or very important ability for every student to have in the learning process. Having problem-solving skills can help students understand complex problems and can develop problem-solving plans so that students can find the right solution for these problems (Rambe & Lisa, 2020). According to research (Rahmmatiya & Asih, 2020) states that students' problem-solving abilities are still in the low category seen from the PTS scores that have been done by students. Therefore, students are trained in their problem-solving skills by using indicators of problem-solving abilities, namely understanding problems, planning, explaining strategies, and checking again (Nursidrati, 2022). Thus, it is important for students to have this problem solving ability because it is important because students can with their own abilities to be able to solve problems. With what has been mentioned, to find out scientific literacy affects students' problem solving abilities, a simple linear regression analysis method will be carried out.

Regression analysis is used to estimate the effect of scientific literacy on the problem solving abilities of junior high school students. There are two types of linear regression, namely multiple linear regression and simple linear regression (Almumtazah et al, 2021). In this study using simple regression analysis. Simple linear regression analysis is a method that has a function to examine the effect of independent variables on the dependent variable (Ginting et al, 2019). Regression analysis that involves one

variable is simple linear regression analysis, while that which uses more than one variable is multiple linear regression (Ardi & Elamanani, 2021). With this linear regression analysis is able to provide estimates or predictions about the effect of the dependent variable on the independent variable.

▪ METHOD

This type of research is a descriptive study with a research population of 8th graders in the odd semester of the 2021/2022 academic year. This study used a sample of class 8E with a total of 29 students. This research was conducted in 2 days using the following research design, conducting research preparation by determining the independent and dependent variables, selecting research samples, adapting scientific literacy questions and problem solving abilities, administering scientific literacy tests, implementing problem solving ability tests, data analysis obtained, get the results from data analysis, discuss the data obtained, draw conclusions from the results and discussion.

The scientific literacy test instrument was adapted from the 2015 PISA Science questions which were used to see students' scientific abilities, while the problem solving ability questions were adapted from OSN questions which had standard questions for problem solving abilities. There are 10 questions on scientific literacy and problem-solving skills each. The data analysis technique used in this research is to use quantitative data analysis techniques with simple linear regression analysis methods to see the effect of two variables, namely scientific literacy and problem solving abilities (Iqbal, 2008). simple linear regression analysis method. Regression analysis is a statistical calculation to test how closely the relationship between variables (Trianggana, 2022).

Scientific literacy and problem solving skills have several indicators that must be achieved by students. Scientific literacy indicators are identifying valid scientific opinions, understanding research design elements, being able to solve problems based on scientific phenomena, understanding and interpreting basic statistics, being able to make inferences, predictions and drawing conclusions based on data (Hasasiyah et al, 2020). Solving abilities Problems also have indicators according to Polya including: understanding the problem, planning problem solving, carrying out problem solving plans, and re-examining the solution (Ramadhana et al, 2021).

▪ RESULT AND DISSCUSSION

This study used simple linear regression analysis using primary data from the results of tests of scientific literacy and problem solving abilities. This research will answer the hypothesis and will find out whether scientific literacy affects problem solving ability or not. In the research that has been carried out, it is found that the student data on the science literacy test are as follows

Table 1. Percentage of scientific literacy criteria

Category	Number of Students	Percentage
High	6	28.57%
Middle	12	57.14%
Low	1	4.76%
Very Low	2	9.52%

From these data it shows that the most students are on good criteria 6 students with a percentage of 28.57%, sufficient criteria with 12 students and a percentage of 57.14%, very low 2 students with a percentage of 9.52% and low amounting to 1 person with a percentage of 4.76%. Very low criteria have a higher percentage than the low criteria. This shows that there are still not many students who do scientific literacy well. According to previous research which stated that the experimental class had an increase of 70.16% into good criteria and the control class 50.40% with sufficient criteria (Muhammad & Ani, 2019). Therefore, scientific literacy needs to be improved to be able to affect students' problem solving abilities. In addition, scientific literacy is important because with scientific literacy students will understand science more fully. Thus, scientific literacy can also be seen from the achievement of the criteria of each scientific literacy indicator as follows.

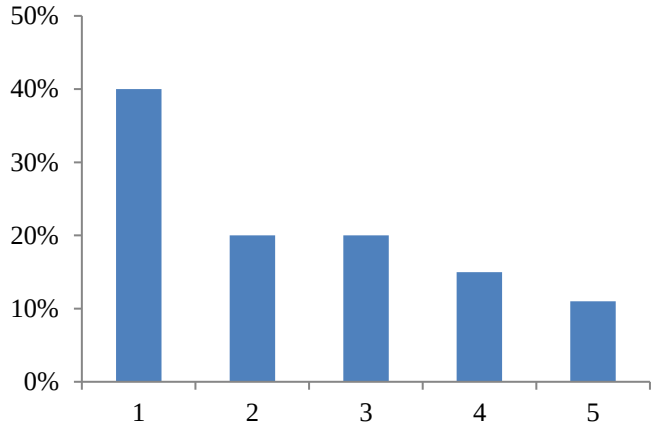

Figure 1. Percentage of achievement of literacy

Indicators the highest percentage of achievement indicators is the first aspect of 40% of this, it can be seen that students find it easier to identify scientific opinions found. The second and third aspects have the same percentage of 20% so that in understanding the elements of research design and solving problems based on scientific phenomena, students have the same level of achievement. The fourth aspect of getting a percentage of 15% in this case shows that students are still difficult to interpret basic statistics. The fifth aspect gets a percentage of 11% in this case students are still difficult to make inferences, predictions and drawing conclusions based on data. It can be seen that the fifth indicator has the lowest percentage compared to other indicators. The results of the analysis of the percentage of students' problem-solving ability criteria are as follows

Table 2. Percentage of criteria for problem-solving ability

Category	Number of Students	Percentage
Excellent	18	62.06%
Good	11	37.93%
Fair	-	-

Poor	-	-
Bad	-	-

Data on the percentage of problem solving ability criteria, namely the very good criteria of 62.06%, the good criteria with the percentage of 37.93%, while for the sufficient, less, and very poor criteria, none. This is because as many as 18 students entered the sufficient criteria and 11 entered the good criteria, these students came from a total of 29 students. Thus, there are no students who get marks on the criteria enough, less, and very less. While the percentage of the problem-solving ability indicator is as follows:

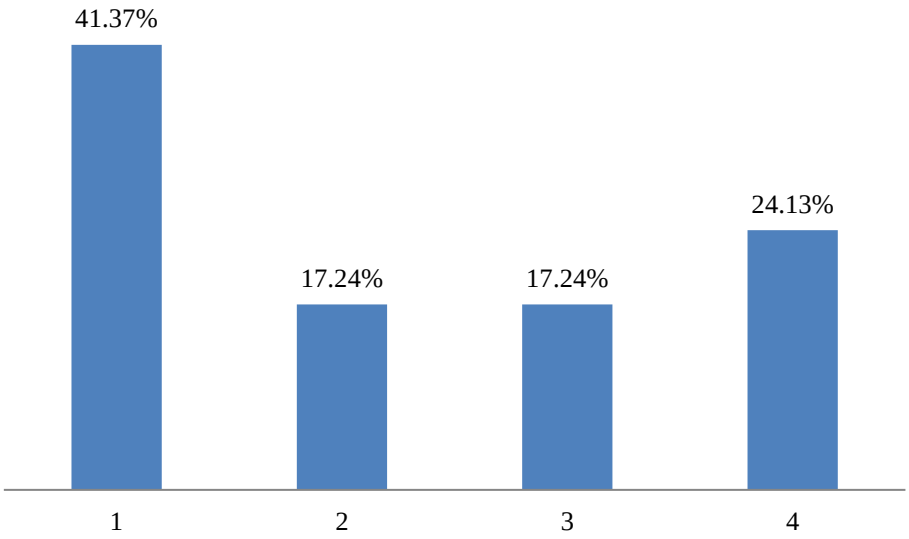

Figure 2. Percentage of indicators of problem-solving ability

There are four indicators of problem solving ability indicators, the first aspect with a percentage of 41.37% this shows that the ability to understand the problems that students have is the highest. The second indicator aspect with a percentage of 17.24% is the same as the third aspect, the two aspects are planning problem solving, carrying out problem solving plans which show that students in doing these two aspects still often find it difficult. While the fourth aspect is 24.13%, namely re-examining the solution, in this case it is easy for students to re-examine the solution. This is in accordance with previous research which stated that the indicator of understanding the problem got the highest percentage (Dewi & Hendy, 2019). Therefore, the easiest aspect that students can do in problem solving is the ability of students to understand the problem before analyzing the problem. Thus, it will be known whether or not there is an influence of scientific literacy on problem solving abilities. The results of the SPSS analysis of scientific literacy and problem-solving abilities are as follows:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	295,516	1	295,516	48,734	,000[b]
	Residual	163,726	27	6,064		
	Total	459,241	28			

a. Dependent Variable: Pemecahan Masalah

b. Predictors: (Constant), Literasi Sains

Figure 3. Analysis of variance of the regression model

In this study, there were SPSS test results that the calculated F value was 48.743 with a significance value of 0.000. This shows that the significance value of the data analysis is 0.000 <0.05. From the data analysis using SPSS, it shows that there is an influence of the scientific literacy variable (X) on the problem-solving ability variable (Y). In accordance with previous research which stated that the significant value of work stress (X) was smaller (<) than 0.05, meaning that there was an effect of work stress (X) on employee performance (Y) (Sartika et al, 2022). Thus, it can show an increase in problem-solving ability test scores because of the influence of students' increasing scientific literacy. In addition, it will be known based on the coefficient of determination which will determine the factors that indicate this influence.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,802[a]	,643	,630	2,463

a. Predictors: (Constant), Literasi Sains

Figure 4. Regression and determination coefficient

From the results of the SPSS analysis, it shows that the coefficient of determination is 64.3%, which means that 64.3% are scientific literacy indicator factors as described, namely identifying valid scientific opinions, understanding research design elements, being able to solve problems. based on scientific phenomena, understand and interpret basic statistics, able to make inferences, predictions and draw conclusions based on data. While the remaining 35.7% there are several other factors that were not examined by researchers. This is in accordance with previous research which stated that the coefficient of determination was 80.46%, it was a factor of production, harvested area, crop area, and rainfall transformation while the remaining 19.54% was found in other factors not examined (Padilah & Riza, 2019). Thus, the estimated value will be determined through t_{table} and $t_{count.}$

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	52,049	4,246		12,258	,000
	Literasi Sains	,401	,057	,802	6,981	,000

a. Dependent Variable: Pemecahan Masalah

Figure 5. Unstandardized and standardized coefficient of the model

The figure shows that there is a Tcount value of 6.981 which is known from the results of the SPSS test. However, it will be compared with Ttable to determine the effect of scientific literacy on problem solving. T table shows the result of 2,051, it shows that Tcount is 6,981 > Ttable is 2,051. Thus, scientific literacy (X) affects problem solving ability (Y). With all existing data, it can answer the hypothesis made by researchers, namely scientific literacy (X) affects problem solving ability (Y).

▪ CONCLUSION

Based on the results of the data analysis and discussion that has been carried out, a conclusion is obtained that the highest percentage of students' literacy criteria is on the sufficient criteria of 57.12% and there are also some students who have very low criteria, namely 9.52%. In addition, the indicator with the highest percentage is an indicator of identifying valid scientific opinions. In the problem-solving ability, the highest percentage of the criteria is very good at 62.06% and the first indicator is the highest, namely understanding the problem. Simple linear regression analysis in this study shows that there is an effect of scientific literacy (X) on problem solving ability (Y). This research can find out how scientific literacy can affect students' problem solving abilities so that scientific literacy needs to be improved again.

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