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Research Artikel

THE SCIENCE LITERACY ABILITY OF STUDENTS IN JUNIOR HIGH SCHOOL REVIEWED BY THE SCIENCE LITERACY ABILITY OF TEACHERS AND SCHOOL GEOGRAPHICAL LOCATION

KEMAMPUAN LITERASI SAINS SISWA SEKOLAH MENENGAH PERTAMA (SMP) DITINJAU DARI KEMAMPUAN LITERASI SAINS GURU DAN LETAK GEOGRAFIS SEKOLAH

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Abstrak

Penelitian ini bertujuan untuk mengetahui kemampuan literasi sains siswa berdasarkan kemampuan literasi sains guru di kota dan di desa. Kemampuan literasi sains siswa dan guru di kota dan di desa diukur dengan mengunakan dua jenis tes instrumen yang berbeda untuk guru dan siswa yang masing-masing terdiri dari 40 soal PISA dan TIMSS yang sudah di modifikasi. Metode yang digunakan dalam penelitian adalah Ex-Post Facto. Populasi penelitian tiga sekolah di desa dan tiga sekolah di kota yang diambil secara purposive sampling berdasarkan nilai UN tinggi, sedang dan rendah di dua wilayah yang berbeda di kota dan desa, dengan jumlah subjek penelitian 480 siswa dan 16 guru yang diambil secara acak. Analisis data menggunakan uji ANAVA Faktorial 2x2x3. Hasil penelitian menunjukkan: 1) terdapat pengaruh letak geografis sekolah di desa dan di kota terhadap literasi sains siswa dengan p<0,00 ; 2) Tidak terdapat pengaruh nilai UN terhadap skor literasi sains siswa dengan p>0,189 ; 3) tidak terdapat pengaruh literasi sains guru terhadap literasi sains siswa dengan p>0,318 ; 4) terdapat pengaruh letak geografis di kota dan di desa dengan input UN terhadap literasi sains siswa dengan P<0,00 ; 5) tidak terdapat pengaruh letak geografis dengan literasi guru terhadap skor literasi sains siswa p>0,194 ; 6) terdapat pengaruh input skor UN dengan literasi sains guru terhadap skor literasi sains siswa dengan P<0,00 ; 7) tidak terdapat pengaruh letak geografis, nilai UN dan literasi guru terhadap skor literasi sains siswa dengan P>0,712.

***Kata Kunci**: literasi sain;, sekolah menengah pertama; letak geografis*

Abstract

This study aims to determine the science literacy ability of students based on teacher's literacy abilities in cities and villages. The science literacy ability of students and teachers both in cities and villages were measured using two different types of test instruments each for teachers and students consisting of 40 modified PISA and TIMSS questions. The method used in this research is Ex-Post Facto. The study population were three schools in the village and three schools in the city chosen by purposive sampling based on the high, medium and low national examination (UN) scores, with the total number of research subjects of 480 students and 16 teachers taken at randomly. Data analysis was made using ANAVA test. The results showed: 1) there is an influence of the geographic location of the school in the village and in the city against students science literacy with p <0.00; 2) there is no effect of UN score on science literacy score of students with p> 0.189; 3) there is no influence of teachers science literacy on students science literacy with p> 0,318; 4) there is an influence of geographical location in city and in village with UN input to students science literacy with P <0,00; 5) there is no influence of geographical location with teachers literacy toward students science literacy score p> 0,194; 6) there is an influence of UN score input with teachers science literacy on science literacy score of students with P <0.00; 7) there is no influence of geographical location, UN value and teachers literacy toward science literacy score of students with P> 0.712.

Keywords: science literacy; junior high school; geographical location (cities and villages)

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INTRODUCTION

Every citizen aged seven to fifteen is obliged to attend basic education, this is in accordance with Article 6 paragraph (1) of Law Number 20 Year 2003. Citizens who are obliged to attend basic education with an age range of seven to fifteen years are referred to as students from elementary to junior high. One of the compulsory subjects that must be followed by students from elementary to junior high is Natural Sciences (IPA). Science needs to be studied as a benchmark for the readiness of Indonesian adolescents in facing modern life, not only requires adolescents to be able to know the science and technology issues, but also can apply them in life.

Children aged 15 years have sufficient cognitive and social skills in thinking. The cognitive abilities of adolescents aged 15 years can be measured by an assessment test called the Program for International Student Assessment (PISA). PISA is an international program supported by Economic Cooperation and Development (OECD), an organization engaged in economic, social and globalization change based in Paris, France. In 2003, there were 41 countries that participated in PISA including 30 OECD member countries and 11 non-OECD member countries. PISA explains that the measured scientific literacy includes individual scientific knowledge, one of which is scientific literacy. Individuals who have good scientific literacy, understand the concepts and ideas that form the basis of scientific thought and can be justified by evidence or theoretical explanation (OECD, 2007).

Science literacy is defined as the ability to use knowledge and information directly between students and teachers (Rychen and Salganik, in PISA 2015). Science literacy consists of knowledge and understanding of science concepts. Knowledge and understanding of scientific literacy are very useful in life such as; the ability of the process to understand the natural environment, identify real evidence from scientific questions, describe, evaluate and provide conclusions (PISA, 2000). Besides being seen from two views of scientific literacy namely content and practice, Gräber's Model shows that scientific literacy is based on three competencies, namely:

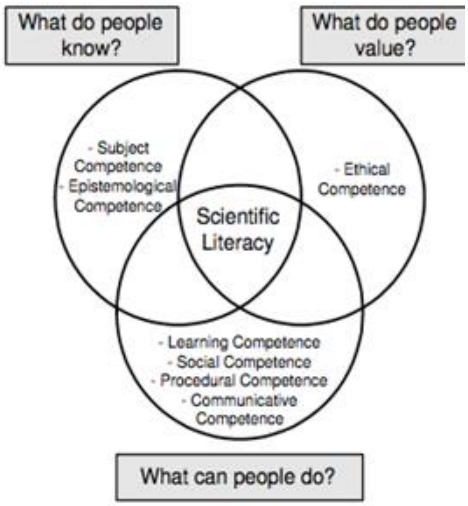


Figure 1. Gräber Model for Science Literacy . Gräber et al., (In Holbrook and Rannikmae 2009)

The Gräber model in Figure 1, shows the intersection between "what do people know" consisting of epistemological and scientific competencies, "what do people value" consisting of moral or ethical competencies and "what can people do" which consists of social competencies , procedural and communication.

The development of scientific literacy is carried out in teaching and learning activities that involve teachers and students. The teacher is an important component in the process of teaching and learning in schools. In accordance with the current curriculum which is the 2013 curriculum, it states that the teacher's function is as a learning implementer in schools; the teacher as a facilitator, meaning that the teacher must be able to facilitate students in learning science and technology especially by providing the learning media needed; teacher as a mediator, meaning that a teacher must be able to explain the relationship of science and technology that is developing at this time (Bybee, 2008); the teacher provides character education; the teacher guides students in learning according to a scientific approach; the teacher chooses and uses various methods, media, and learning resources (Nurmalasari, 2013). This is in accordance with Permendiknas No. 16 of 2007 concerning teacher competency standards which states that teachers must have four main competencies, namely

pedagogical, personality, social, and professional competencies.

Judging from the geographical area, educational equality has not yet occurred between urban and rural areas. This is also related to the level of inequality in cities and villages, especially those who are unable to get quality health and education services (Widyatmanti, 2008). During the period September 2016-March 2017, the number of poor people in urban areas rose by 188.19 thousand people (from 10.49 million in September 2016 to 10.67 million in March 2017) and in rural areas decreased by 181.29 thousand people (from 17.28 million in September 2016 to 17.10 million in March 2017) (Tempo.co, 2017). If it is calculated that the poor in Indonesia number around 27.7 million people or 10.64 percent of the total population can be a major obstacle in getting access to education (BPS, 2017). Gaps or poverty that occur between cities and villages can cause differences in the level of knowledge of urban and rural communities (Amalia, 2007). Therefore, the quality of education in urban and rural areas needs to be generalized, because education can change the mindset of the community by getting a lot of knowledge, knowledge and information from the education obtained (Retno, 2011).

Established knowledge and ability of science teachers, can be a benchmark for the success of the teaching and learning process to form students to have a good understanding of scientific literacy and be able to face the global challenges of the 21st century. The 21st century is an era where all knowledge can be obtained through technology, the location of urban and rural areas is an obstacle to being able to access technology. Therefore, to find out if there really is a connection between the literacy ability of junior high school students and the literacy skills of junior high school teachers and the geographical location of schools in cities and villages, a research needs to be conducted on "*The Science Literacy Ability of Students in Junior High School Reviewed by the Science Literacy Ability of Teachers and School Geographical Location* ".

METHOD

The research method used is Ex-Post Facto. The study was conducted in South Jakarta Junior High School and Junior High School in Jati Mulya village, Lebaksiu district, Tegal, Central Java. The study was conducted in the even semester of the 2017/2018 academic year starting in February-March 2018. The research design used was a 2x3x2 factorial design as shown in Table 1.

Table 1. Research Design of Literacy Ability in Middle School Students (SMP) in terms of Teacher's Literacy Capability and School Geographical Position

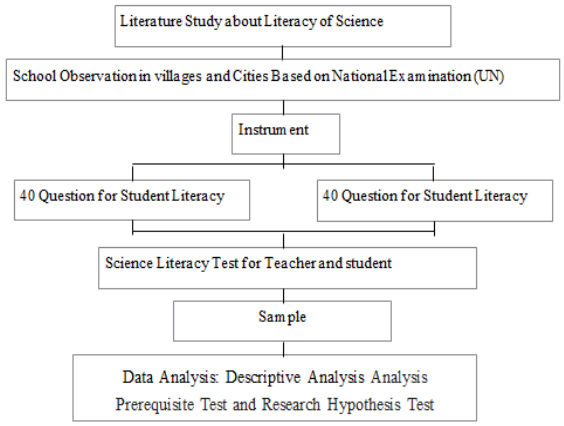
Geographical Location (B)	**Score Level National Examination (C)**	**Teacher (A)**	
		High Science Literacy (A1)	**Low Science Literacy (A2)**
Cities (B1)	High (C1)	$\mu A_1B_1C_1$	$\mu A_2B_1C_1$
	Medium (C2)	$\mu A_1B_1C_2$	$\mu A_2B_1C_2$
	Low (C3)	$\mu A_1B_1C_3$	$\mu A_2B_1C_3$
Villages (B2)	High (C1)	$\mu A_1B_2C_1$	$\mu A_2B_2C_1$
	Medium (C2)	$\mu A_1B_2C_2$	$\mu A_2B_2C_2$
	Low (C3)	$\mu A_1B_2C_3$	$\mu A_2B_2C_3$

The population in this study were all junior high school students in Jakarta and Central Java, while the affordable population was junior high school students in the city of South Jakarta, Cilandak sub-district and junior high school in Jatimulya village, Lebaksiu sub-district. Schools in one sub-district were selected by purposive sampling based on the input of UN scores in the high, medium and low categories as research sites.

The sample taken was one parallel, grade 9, in each school with the highest, medium and lowest criteria based on the results of the UN score input. The number of student populations in junior high schools in cities and villages. In South Jakarta 9th grade junior high school students at SMPN 131, SMPN 96 and SMPN 37 consist of 9 classes each class totaling 40 students. In Jatimulya Village in the Babakan MTs N school model, Lebaksiu 1 Junior High School, Lebaksiu 2 Junior High School consisted of 40 students and 9 class students in each school. While every school there are 3 science teachers. Thus, the total minimum sample used was 468 students and 18 science teachers in cities and villages.

The data collection technique for this research is done by sample random sampling method. While the research flow is as follows:

Figure 2. Research flow



RESULT AND DISCUSSION

Literacy scores obtained consist of two types of nominal data, namely students scientific literacy scores and teachers scientific literacy scores. Student and teacher science literacy scores consist of students scientific and literacy scores in cities and villages divided into three regional levels based on the input of the national exam scores, namely high, medium and low. Complete data on teacher literacy scores, geographical location or location (village and city) and school level based on input UN scores on student scientific literacy can be seen in Table 7.

Table 2**.** Data Description Effect of Teacher's Literacy, National Examination, School Geographical Position on Junior High School Student Literacy.

Location	Final Examination (UN)	Science Literacy	Mean	Standard Deviation	N
Villages	Low	Low	16,05	5,430	40
		High	14,68	4,864	40
	Middle	Low	15,22	3,899	40
		High	17,27	3,359	40
	High	Low	18,75	4,093	40
		High	18,45	4,574	40
Cities	Low	Low	23,53	4,255	40
		High	21,47	5,392	40
	Middle	Low	20,10	5,965	40
		High	20,10	4,517	40
	High	Low	17,98	4,388	40
		High	17,15	3,159	40

The mean is greater than the standard deviation with a difference above 25%, thus indicating that the results are quite good. That is because the standard deviation is a reflection of a very high deviation, so that the spread of data shows normal results and does not cause bias.

a. Normality Test

Normality testing is done by the Kolmogorov Smirnov test using the SPSS 23 application. Based on the calculation results it can be concluded that the data is normally distributed because p> 0.05.

Table 3**.** Normality Result with SPSS 23

One-Sample Kolmogorov-Smirnov Test

		literasisainsswa	literasusainsguru
N		480	19
Normal Parameters[a]	Mean	16.36	23.16
	Std. Deviation	5.027	3.640
Most Extreme Differences	Absolute	.091	.167
	Positive	.091	.093
	Negative	-.044	-.167
Kolmogorov-Smirnov Z		2.002	.728
Asymp. Sig. (2-tailed)		.001	.665

b. Homogeneity Test

Homogeneity test was performed using the Bartlett Test. Homogeneity test results obtained by Q2hit equal to Q2 table amounted so that it was concluded that the data obtained has a homogeneous variance because Q2hit (0,000) <Q2 table (0.005). Homogeneity calculations can be seen in the appendix.

Table 4. Homogeneity Result with SPSS 23

Test of Homogeneity of Variances

	Levene Statistic	df1	df2	Sig.
lokasi	8.344	24	453	.000
un	.986	24	453	.484
literasiguru	8.137	24	453	.000

Testing the hypothesis in this study using the 2x2x3 Factorial ANAVA Test in which there are four independent variables and one dependent variable. In this research there are seven

hypotheses. The table explains the results of the hypothesis test on each hypothesis.

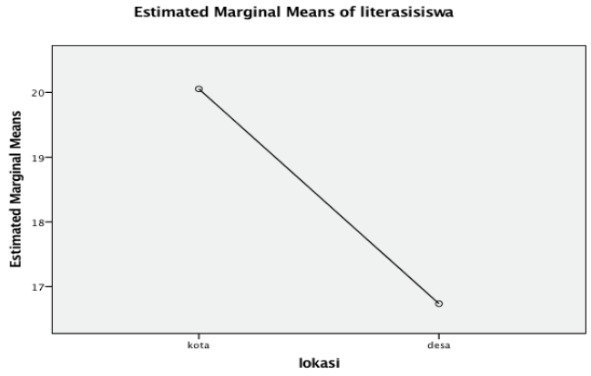
Table 5. Analysis of Variance Effect of Teacher's Literacy, National Examination Score, School Geographical Position on Secondary School Student Literacy

Source	Type III SUM of Square	df	Mean Square	F	Sig
Corrected Model	2964,542[a]	11	269,504	12,952	.000
Intercept	162435,208	1	162435,208	7806,2	.000
location	1320,033	1	1320,033	63,438	.000
Input UN	69,504	2	34,752	1,670	.189
Teacherliteracy	20,833	1	20,833	1,001	.318
location*input UN	1353,679	2	676,840	32,527	.000
location*Teacherliteracy	35,208	1	35,208	1,692	.194
Input UN*literasiguru	151,154	2	75,577	3,632	.027
locaton*input UN*Teacherliteracy	14,129	2	7,065	.340	.712
Error	9738,250	468	20,808		
Total	175138,000	480			
Corrected Total	12702,792	479			

The effect between variables is seen based on the significance value in each column, Reject Ho if the calculated value is less than 0.05. The calculation results are shown in appendix 6. The explanation is as follows:

First, there is an influence of geographical location on students scientific literacy with a calculated p value of 0,000, this is shown in Figure 2. Students scientific literacy in cities is higher than students scientific literacy in villages. This is in line with what Fatkhuri said, (2013) geographically the location of the village is located at a considerable distance from urban areas and it is certain that the rural population has very limited access to various sources such as education. This limited access will affect the availability of facilities to meet teaching and learning needs.

Figure 3. The graph of the influence of geographical location on students' scientific literacy.



Rural areas do experience a lot of development, but the conditions are still far different from urban areas. Based on data from the Central Statistics Agency (BPS), the number of rural poor in the province on a national scale is higher than in urban populations. According to BPS (Statistics Indonesia) data for 2017 the number of poor people in urban areas is 10.27 and in villages 16.31 people. This is in line with what was stated by Jonston in Rehman, (2015) which states that the economic growth of an area has an important contribution in the world of education, the better the level of education that an area has is marked by an increase in the standard of living of its people. Because actually education is the main thing needed by humans to build a country.

Second, there is no effect of the UN score on the scientific literacy score of students, with a p value of 0.189. The national exam is a test to measure students learning achievements in certain subjects, this step is carried out by the government to improve the quality standards of education.

Schools in cities with high UN score input have low student scientific literacy and schools with low UN scores have high student scientific literacy. In village villages with high UN score input have high student literacy and schools with low UN score scores have low science literacy also this is evident in Figure 5. There is no influence of UN score input with high, medium and low categories with student scientific literacy according with research conducted by Ramadhan (2013) which states that the questions presented in the UN are lower than the TIMSS and PISA questions so that the UN scores cannot measure the scientific literacy of students in schools.

Third, there is no effect of high and low teacher scientific literacy in cities and villages on students' scientific literacy scores. This is contrary to what was said by Amin (2017) which states that teachers have an important role in the field of education and learning in schools, because teachers are facilitators and mediators for students to be able to learn effectively and efficiently. Professional teachers are teachers who are aware of the importance of learning because of the development of technology it requires qualified human resources,

aware of the need for scientific content and aware of how to learn or teach by continuing to innovate in the learning process.

The absence of the influence of teachers scientific literacy on students 'scientific literacy can be said that the teacher as a facilitator and mediator in learning sometimes does not affect students' knowledge and understanding in school. In fact teachers who have high scientific literacy can have students with low scientific literacy and teachers who have low scientific literacy can also have students with high scientific literacy. This is in accordance with what was stated by Piaget in Hendrizal (2015) that students come to school not in an empty condition, meaning that students already have basic knowledge gained from their daily personal experiences. Two processes that are responsible for the development of knowledge that children have are assimilation and accommodation. Assimilation occurs when a child incorporates new knowledge into existing knowledge and accommodation occurs when the child adjusts their schemes to the new information or knowledge obtained. From that it can be said that the teacher's literacy ability does not affect the scientific literacy of students due to differences in initial knowledge that students have.

Fourth, there is the influence of location or geographical location in cities and villages with high, medium and low UN input scores on student scientific literacy. Geographical location and input of UN scores affect student's scientific literacy, indicating that students in cities with high UN score input can be said to have high scientific literacy. While students in villages with low UN score input can be said to have low scientific literacy. This is in line with what Anas (2007) said that the phenomenon of upper class community education in urban schools sends their children to good quality schools, because they have competent teachers, complete facilities and intelligent students. Meanwhile, in villages sometimes unable to deal with the rapid progress of the city one of them caused by the weaknesses of the existing education system in the village itself. Thus, differences in education levels in cities and villages can occur because of the types of high, medium and low schools that affect the differences in facilities causing differences in knowledge in general and science literacy in particular.

Fifth, there is no influence of location or geographical location in cities and villages with high and low teacher literacy in cities and villages on science literacy scores. Geographical location and teacher science literacy in cities and villages have no effect on students scientific literacy. This means that teachers who teach in cities do not always have high scientific literacy, so they can have low or high student scientific literacy. And teachers who teach in villages do not always have low scientific literacy, so they can have low or high student scientific literacy.

There is no influence between the geographical location and teacher science literacy on students' scientific literacy in schools because the government is preparing programs to improve the quality of teachers in cities and villages through the national literacy movement. The national literacy movement (GLS) began in 2017 for schools, families and communities who teach in villages and cities from elementary, junior high and high school levels. The GLS program in schools conducted by the Ministry of Education and Culture (2017) for teachers is carried out by strengthening the capacity of facilitators by holding science teacher training in applying inquiry and scientific thinking processes and learning methods based on problems that arise in everyday life. Teachers are trained to choose, create and modify everyday problems that can be used in learning scientific literacy. With the GLS program teachers in cities and villages are expected to have the same ability to teach science based on scientific literacy.

Sixth, there is an influence of UN input scores in high, medium and low schools with teacher science literacy in cities and villages high and low on students' scientific literacy scores. So it can be said that teachers with high scientific literacy who teach in schools with high UN score scores must have students with high scientific literacy. Whereas teachers with low scientific literacy who teach in schools with low UN score scores must have students with low scientific literacy. This is in line with what was stated by

Anggela (2012), that the pros and cons of a formal education institution, namely schools, if they have qualified education personnel and are able to carry out learning well. Teachers with high professionalism competency tend to have high student achievement, because they have the ability to be able to develop learning to the maximum with the support of creative and innovative learning resources and media. With the existence of innovative learning will encourage students to get high learning achievements and can be seen from the average acquisition of UN score inputs.

Seventh, there is no influence of location or geographical location, UN scores and teacher literacy on students' scientific literacy scores. The absence of interaction or influence between geographical location, teacher science literacy in cities and villages, UN score scores in high, medium and low schools on science literacy are influenced by differences in scientific literacy knowledge in each of the aspects studied. The results showed that the scientific literacy of students in the city was higher than that in the village but the teacher's scientific literacy in the village was higher than that of the teachers in the city, this indicated that the teacher's scientific literacy knowledge did not affect the students scientific literacy knowledge. According to Gormally in Rizkita (2016) the ability of scientific literacy is defined as a person's ability to distinguish scientific facts from various kinds of information, recognize and analyze the use of methods, analyze, and imply scientific information. Students 'differences in interpreting the knowledge provided by the teacher are the main factors causing the teacher's scientific literacy not to affect the students' scientific literacy.

Based on the results of the study, the main factor influencing students scientific literacy is geographical location in cities and villages. Social inequality and poverty are the main causes of differences in knowledge in cities and villages due to limited access, facilities and learning media. However, scientific literacy is the main key to face the challenges of the 21st century to meet water and food needs, control disease, produce enough energy and deal with UNEP climate change in the Ministry of Education and Culture (2017). Knowledge of science and technology based on science has a significant contribution to personal, social and professional life. Literacy helps us to shape mindsets, behavior and build human character to care for and be responsible for himself, society and the universe, as well as the problems faced by modern societies that depend heavily on technology.

CONCLUSION

Equitable education in cities and villages needs to be generalized so that there is no gap in facilities that can support the teaching and learning process of students in schools. If the learning support facilities are the same, the process of delivering or transferring knowledge from teacher to student is getting better and student literacy towards science will increases.

This research has an implication that the knowledge literacy of science teachers is not a good measure of good or not the students literacy. Teachers in villages have better scientific literacy than teachers in urban science and teachers with high scientific literacy can have students with low scientific literacy and teachers with low scientific literacy can have students with high scientific literacy. Thus, students scientific literacy is influenced by how students progress in understanding their basic knowledge is based on experience with knowledge after learning from teachers at school.

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