

An Analysis of Scientific Literacy of Students of SMPN 4 Tanjung Pinang and of SMPN 6 Tanjung Pinang

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Abstract – This study aimed to describe the results of the analysis of scientific literacy skills of students of SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang. This research is descriptive research. The technique of sampling was *purposive sampling*. The data collection technique used the PISA scientific literacy questions of 2015 and was supported by interviews between students and a teacher. The data analysis technique was carried out by calculating the average value of the students' scientific literacy test results. The technique of checking the validity of the data used triangulation. The results showed that the achievement of students' scientific literacy was in the low category. The conclusion of this study is the achievement of the result of the scientific literacy test of students of SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang based on the total score showed that the ability of students of SMPN 4 Tanjung Pinang in answering scientific literacy questions is higher than the students of SMPN 6 Tanjung Pinang.

Keywords – 21th Century Education; Analysis; Scientific Literacy; Science.

I. INTRODUCTION

In this era of 21st century, science and technology are thriving; everything can be managed using technology. Students must understand technological developments and be able to use them wisely in order to balance the development of science and technology (Utami, 2018: 24). The 21st century education aims to encourage students to have various abilities as provisions that support students in preparing for the current development and global competition. One of the important abilities that students must have in the 21st century is scientific literacy (Rahmadani, 2018: 184).

Scientific literacy is the ability to use knowledge to identify problems, acquire new knowledge, explain scientific phenomena, and draw conclusions based on evidence related to scientific issues (Wulandari, 2016). According to the Program for International Student Assessment (PISA), scientific literacy is defined as the ability to use scientific knowledge, identify questions and draw conclusions based on evidence in order to understand and make decisions regarding to nature and changes made to nature through human activities (OECD, 2016 : 10).

In PISA (2015), it is explained that scientific literacy is the ability to apply concepts or facts obtained at school with natural phenomena that occur in everyday life. The existence of scientific literacy in schools can make students understand the natural science learning scientifically by providing direct learning experiences.

Scientific literacy is one of the areas of PISA study. The PISA assessment (2015) was carried out from four aspects, namely competence, knowledge, context, and attitude (OECD, 2013). PISA is an ongoing program that offers knowledge for educational policy and practice. PISA also helps to monitor current events in the acquisition of knowledge and skills of students throughout the country and various demographic subgroups in each country (Pratiwi, 2019: 54).

The fact that the PISA survey results from 2000 to 2018 placed Indonesia as one of the countries with a low scientific literacy ranking. The achievement of Indonesia's scientific literacy index in PISA in 2018 was still below the OECD average score. The average science score for the domain of scientific literacy in OECD countries is 489, while Indonesia has only reached a score of 396. (Yosef, 2019: 62).

The measurement data of PISA states that the scientific literacy skills of students in Indonesia are in the low category. The average score of Indonesian scientific literacy based on the results of successive PISA studies from 2000 to 2018 can be seen in Table 1 below.

Table 1. The Achievement of Indonesian Science Literacy Index in PISA Study Results

Year	Indonesia Average Score	PISA Average Score	Ranking	Number of State Participants
2000	393	500	38	41
2003	395	500	38	40
2006	393	500	50	57
2009	385	500	60	65
2012	375	500	64	65
2015	403	500	62	70
2018	396	489	70	78

Source: (OECD, 2020)

Based on Table 1, the researcher can conclude that the scientific literacy skills of Indonesian students are still below the average when compared with the average international score. PISA ranking results in 2018 Indonesia is ranked 70th out of 78 countries with a score of 396.

High scientific literacy skills are important for every Indonesian student to have. This is due to the ability of scientific literacy to play a role in determining the progress of a nation. Indonesia ranking, which is still very low in the assessment of world scientific literacy, reflects the Indonesian education system that is currently running (Nofiana, 2017: 82). Scientific literacy is very important to solve various problems related to ethics, morals and global issues due to the thrift in science and technology (Jamaluddin, 2019: 121). Scientific literacy is a skill that needs to be developed in the face of globalization (Astuti, et al., 2016: 126).

Based on the explanation above, it can be concluded that the ability of scientific literacy is a fundamental thing that the students must have in facing the global era for needs of life in various situations. As with other learning, scientific literacy must also be

applied in learning natural science. Natural science is a knowledge that studies living things, natural phenomena and underlies technological development. Natural science is defined as knowledge obtained through data collection by experimentation, observation, and education to produce a reliable explanation of a symptom (Angraini, 2014: 161). The main objective of natural science education is to make a young generation who is fully awake of science a science. The significance in science learning for students can be obtained if students have good scientific literacy skills (Yanti, et al., 2015).

The result of observation for 1 month indicates that science learning in school has been going well and is in accordance with the curriculum, but has not been guided by science literacy-based learning. This can be seen from the many components of scientific literacy that have not been implemented, such as science learning that has not identified scientific issues, explained scientific phenomena, interpreted scientific evidence, identified assumptions, evidence, and the reasons behind conclusion, reflected on the social implications of science and technological developments. Science learning in school tends to be on the content dimension more than to be on the context and competency dimensions.

Based on the problem above, the researcher wanted to analyze the scientific literacy skills of students of SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang by conducting tests adopted from PISA (2015) questions based on translated scientific literacy. The test was carried out in two schools to measure the achievement of students' scientific literacy skills in each school with an A accreditation school status.

It is important to analyze the achievement of students' scientific literacy skills in order to find out the factors that affect the results of scientific literacy and the efforts to improve scientific literacy so that they can provide the right solutions for the problems, especially in science and improving the quality of science learning.

Based on the problem above and considering the importance of scientific literacy for students, the researchers conducted a study entitled "Analysis of the Science Literacy Ability of Students of SMPN 4 Tanjung Pinang and of SMPN 6 Tanjung Pinang".

II. RESEARCH METHOD

This type of research is a descriptive research with a purposive sampling technique based on the equal status of each school, which is A Accredited School, then two schools were selected, which were SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang.

The data collection technique used the 2015 PISA science literacy questions and was supported by interviews between students and a teacher. Data analysis techniques were carried out by calculating the average score of the students' science literacy test results. The technique of checking the validity of the data used triangulation technique.

III. RESULT AND DISCUSSION

The data on the achievement of scientific literacy had been collected from research respondents, which were students of SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang. The data were obtained from test conducted on students and supported by interviews between students and a teacher.

The test results showed that the science literacy achievement of students was in the low category. The low achievement of scientific literacy can be seen from the average score obtained based on the total score and scientific competence. The scientific literacy achievement data of students are presented in Table 2 to Table 6.

3.1 Science Literacy Test Result Based on Total Score

Table 2. Science Literacy Test Results Based on Total Score.

School	SMPN 4 Tanjung Pinang			SMPN 6 Tanjung Pinang			Total
Class	IX.1	IX.2	IX.3	IX.1	IX.4	IX.5	
Average Score	53,86	47,96	57,08	36,43	37,08	32,94	45,98
Category	Low	Low	Low	Low	Low	Low	Low

3.2 Science Literacy Test Results Based on Science Competency Aspects Explaining Scientific Phenomena.

Table 3. Scientific Literacy Test Results Based on Science Competency Aspects Explaining Scientific Phenomena.

School	SMPN 4 Tanjung Pinang			SMPN 6 Tanjung Pinang			Total
Class	IX.1	IX.2	IX.3	IX.1	IX.4	IX.5	
Average Score	22,57	21,48	23,96	16,07	17,08	14,71	19,93
Category	Low	Low	Low	Low	Low	Low	Low

3.3 Science Literacy Test Results Based on the Aspects of Evaluating and Designing Scientific Research.

Table 4. Scientific Literacy Test Results Based on the Aspects of Evaluating and Designing Scientific Research.

School	SMPN 4 Tanjung Pinang			SMPN 6 Tanjung Pinang			Total
Class	IX.1	IX.2	IX.3	IX.1	IX.4	IX.5	
Average Score	7,14	7,04	8,96	7,32	7,08	6,18	7,34
Category	Low	Low	Low	Low	Low	Low	Low

3.4 Science Literacy Test Results Based on Science Competency Aspects Interpreting Scientific Data and Evidence.

Table 5. Results of Science Literacy Tests Based on Aspects of Science Competence Interpreting Scientific Data and Evidence.

School	SMPN 4 Tanjung Pinang			SMPN 6 Tanjung Pinang			Total
Class	IX.1	IX.2	IX.3	IX.1	IX.4	IX.5	
Average Score	24,14	19,44	24,17	13,04	12,92	12,06	18,71
Category	Low	Low	Low	Low	Low	Low	Low

3.5 Science Literacy Test Results Based on Total Science Competency Aspects.

Table 6. Results of Science Literacy Tests Based on Aspects of Total Science Competence.

Aspect	Total
Explaining Scientific Phenomena	19,93
Evaluating and Designing Scientific Research	7,34
Interpreting Scientific Data and Evidence	18,71
Average Score	15,32
Category	Low

The main cause of low student scientific literacy is that students have not studied the tested material and are not used to working on scientific literacy problems. According to the students, scientific literacy questions are different and more difficult when compared to science questions given by teacher. The student's statement was confirmed by teacher who stated that the material tested on students had never been taught in science learning. Teachers also have not implemented scientific literacy-based learning and evaluation optimally. This is in accordance with the opinion of Anggraini, G. (2014), students are not accustomed to working on scientific literacy questions using discourse. Teachers in the learning process do not support students in developing scientific literacy skills. The teacher in the learning process does not present something that spurs students to think, such as introductory text, pictures, scenarios of a case or examples of problems, or tools and materials that are not yet familiar to students.

The low scientific literacy of students is also caused by the lack of critical thinking skills or students' reasoning abilities. The ability to think critically or reasoning is very necessary in answering scientific literacy questions. According to the teacher, student reasoning is still low. That is, students have not maximally carried out a critical thinking process that thinks about various things in depth to finally determine the right decision from the problems they are facing. The low critical thinking skills possessed by students

illustrate that the process of learning science learning activities has not been carried out. According to Purwani, et al. (2018), explained that although the competency standards in Indonesia's newest curriculum emphasize the need for scientific-based learning that prioritizes higher-order thinking skills, not all curriculum changes are actualized in the teaching process. This causes the inability of most students to make the right decisions as a solution to the problems in the situation they face.

The ability to think critically is not easily possessed by someone. There are many factors that influence whether or not these abilities need to be familiarized in individuals from an early age (Cahyana, et al., 2007; Zubaidah, 2016). There are several components that can build critical thinking skills, namely formulating and analyzing arguments, asking questions and providing answers, assessing the credibility of information sources, conducting and assessing reports on observations, making and assessing deductions and inductions, identifying and assessing identification, identifying, deciding and carry out assumptions, as well as interact with others (Fisher, 2011). It takes habituation in the learning process with using multi-model, multistrategy and multimedia to form students' critical thinking skills (Agnah, et al. (2018); Miharja, et al. (2019); Nurhayati, et al. (2019); Permana & Chamisijatin. (2019); Pratama, et al. (2019); Suraya, et al. (2019).

Another cause of low student scientific literacy is the weak ability of students to read and interpret reading. Students have difficulty filling in answers because they do not understand the questions. According to the students, the scientific literacy questions being tested contained discourses that had to be read first and made students think more deeply to understand the content of the discourse in order to answer the questions. The student's statement was confirmed by the teacher who stated that the willingness and ability of students to read was still low. Based on these statements, it is known that the students' ability to read and interpret reading is still low. This is in accordance with the opinion of Fuadi, H. (2020), one of the obstacles of students in scientific literacy is the low ability to read and interpret reading. Research conducted by the United Nations educational, scientific and cultural organization (UNESCO) in 2016 on 61 countries in the world shows that reading habits in Indonesia are classified as very low. The results of the study, published under the name "The World's Most Literate Nations", show that Indonesia is ranked 60th.

Efforts that can be made to overcome these problems are implementing a scientific literacy-based teaching and learning process by arranging learning tools that contain aspects of scientific literacy. According to Ridho (2018: 53), the application of science literacy-based learning to prepare science literate students can be done by compiling a Lesson Plan which contains aspects of scientific literacy. This is also in accordance with the results of research by Siagian (2017: 176), which states that teachers, schools and education authorities need to make improvements in the learning process to improve students' scientific literacy, such as the application of learning models.

According to Nisa (2018: 161), the application of the Two Stay Two Stray learning model with the help of visual media is proven to increase students' scientific literacy compared to the application of the direct learning model. In addition, the implementation of SETS learning has been proven to be effective in increasing students' scientific literacy. This is in accordance with the results of research by Udompong (2014: 5094) and Ristina (2019: According to Nisa (2018: 161), the application of the Two Stay Two Stray learning model with the help of visual media is proven to increase students' scientific literacy compared to the application of direct learning models. Therefore, the implementation of SETS learning has been proven to be effective in increasing students' scientific literacy. This is in accordance with the results of research by Udompong (2014: 5094) and Ristina (2019: 432), SETS learning is effective in increasing students' scientific literacy in each category, namely science as a body of knowledge, science as a way of thinking, science as a way of investigating, and interacting with science, technology, and society.

Another effort that can be done is to train students to work on scientific literacy problems by applying scientific literacy-based evaluation instruments. This is in accordance with the opinion of Rusilowati (2016: 5726) & Rusilowati (2018: 6), it is recommended that teachers apply scientific literacy-based evaluation instruments in learning to train students to work on scientific literacy problems. According to Pamungkas (2018: 161), one of the evaluation instruments based on scientific literacy that can be applied in learning is to use a metacognitive test based on scientific literacy.

IV. CONCLUSION

Based on the results of the research that has been managed, it can be concluded that the achievement of the results of the scientific literacy test of students at SMPN 4 Tanjung Pinang and SMPN 6 Tanjung Pinang based on the total score shows that the ability of students of SMPN 4 Tanjung Pinang in answering scientific literacy questions is higher than that of SMPN students. 6 Tanjung Pinang with the low category.

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