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Analysis of Science Literation and Scientific Attitude at Temperature and Calor

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Abstract

PISA research results in 2009, 2012 and 2015 show that the ability of scientific literacy in Indonesia is still relatively low. This study aims to determine the ability of scientific literacy and scientific attitudes of students. This type of research is mixed methods. The step in explanatory research is that researchers gather and analyze quantitative data first, then followed by the collection and analysis of qualitative data. The research was carried out in three public / private junior high schools. Class VII samples with a purposive or judgmental sampling technique. Data collection methods: 1) Test method, 2) Questionnaire method, and 3) Interview method. Test the validity of data validity and reliability later in data analysis techniques 1) Presentation of data, 2) Reduction of data, 3) Conclusions. The results of this study score distribution of students who answered correctly on tests of scientific literacy skills below the average of less than 50 and included in the category of less. The average value of students on the ability of scientific attitudes in three schools based on the results of the questionnaire that is 64-75 with the average category is high. This is because students are not accustomed to science literacy activities, so the value of students' scientific lietaration is low, while the ability of scientific attitudes of students tends to be high.

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INTRODUCTION

The Program for International Student Assessment (PISA) defines scientific literacy as the capacity to use scientific knowledge, identify questions and to draw conclusions based on evidence in order to understand and help make decisions about the natural world and human interaction with nature (OECD, 2014). Mastery of scientific literacy can not be raised just like that in a short time, but requires a long enough time for its formation. One step to form the ability of science is through education, especially science learning. The orientation of the formation of comprehensive scientific literacy must begin to be applied to children from an early age, of course taking into account the child's growth and development.

Holbrook & Ranikmae (2009) stated that scientific literacy is an appreciation of science by increasing the learning components in themselves so that they can contribute to the social environment. One of the influential factors in the development of science and technology today is the ability related to the mastery of science, which is raised by the term scientific literacy. Science literacy is a very important thing to be mastered by every individual because it is closely related to how one can understand the environment and other problems faced by modern society that are very dependent on the development of science and technology, including social problems. Science literacy can be the basis for someone to take an action by calculating the consequences that might occur. Thus, scientific literacy does not only affect the development of science and technology, but also has a wider influence on human life that can reflect the culture of a community.

After conducting interviews with several science teachers in Bandungan Sub-district Junior High School, there are still many teachers who do not yet have assessment instruments to analyze the scientific literacy skills of students. Most of the assessment instruments used only measure the cognitive aspects. The inquiry approach is expected to be able to measure aspects of scientific literacy skills in students because in inquiry learning students are required to find and find answers themselves to a problem in question. The thought process itself is usually carried out through question and answer between the teacher and students. On the theme of temperature and its changes are closely related to the concept of matter that occurs in everyday life. In addition, the theme of temperature and its changes can be integrated and able to foster student scientific literacy. Students carefully and accurately able to distinguish the kinds of temperature changes that exist in the natural surroundings. Creative students are also able to relate the concept of temperature contained in the material associated with temperature and changes in daily life. Students' concern for the environment can also be measured through temperature themes and their changes through evaluation tools that students receive from the teacher.

Science literature is defined as the capacity to use scientific knowledge, identify questions and draw conclusions based on facts to understand the universe and make decisions about changes that occur due to human activity. While the scientific literacy category is based on the description of Chiappetta et al. (1993) includes four categories, namely the science of science, the investigative nature of science, science as a way of thinking, and the interaction of science, technology, and society (interaction of science, technology, and society).

According to Anwar (2009) Scientific attitudes are distinguished from mere attitudes towards science, because attitudes towards science are only focused on whether students like or dislike towards learning science. Then according to Sardinah (2012) Scientific attitude is a benchmark of research ethics of scientists in undergoing scientific activities. If the scientific attitude of students in carrying out the experiment does not have, it will have a negative impact on the products they produce. Pillai (2012) examines learning analysis of

scientific attitudes that occur in second grade students in India. This study proves that there are no significant differences in the scientific attitudes of both men and women, there are significant differences in the scientific attitudes that occur in formal and informal school children and there are significant differences in children in the rural environment and overseas environment. Scientific attitude is one form of intelligence possessed by each individual. The scientific attitude of students in learning can affect student learning outcomes. Scientific attitudes of students are basically no different from other skills (cognitive, social, process, and psychomotor). To bring up students 'scientific attitudes also need a learning model that is in accordance with the indicators possessed by students' scientific attitudes. In learning scientific attitudes students are very much needed an attitude of curiosity, working together openly, working hard, responsible, caring, disciplined and honesty. Inquiry learning trains students to learn science from finding problems, composing hypotheses, planning experiments, analyzing data, and drawing conclusions about scientific problems, so students can learn science more clearly.

METHODS

This type of research is a mixed method. This mixed method research uses sequential explanatory research design. The step in explanatory research is that researchers gather and analyze quantitative data first, then followed by the collection and analysis of qualitative data. The research was carried out in three public / private junior high schools. The population is Grade VII students from junior high schools who have different accreditation values and have used the 2013 curriculum. The sample taken is a class VII with a purposive or judgmental sampling technique. The method used for data collection in this study are: 1) Test method, 2) Questionnaire method, and 3) Interview method. Data Validity Test With validity and reliability then in data analysis techniques, namely 1) Presentation of data, 2) Reduction of data, 3) Conclusions.

RESULTS AND DISCUSSION

Description of Science Literacy Capabilities

The ability of scientific literacy measured in this study includes the ability to explain scientific phenomena, evaluate and design scientific investigations and facilitate scientific data and evidence. In figure 1 the distribution of point scores shows that the sample that answers the most is true in the ability to interpret data and scientific evidence, second in the ability to explain scientific phenomena, and finally evaluate and design scientific investigations.

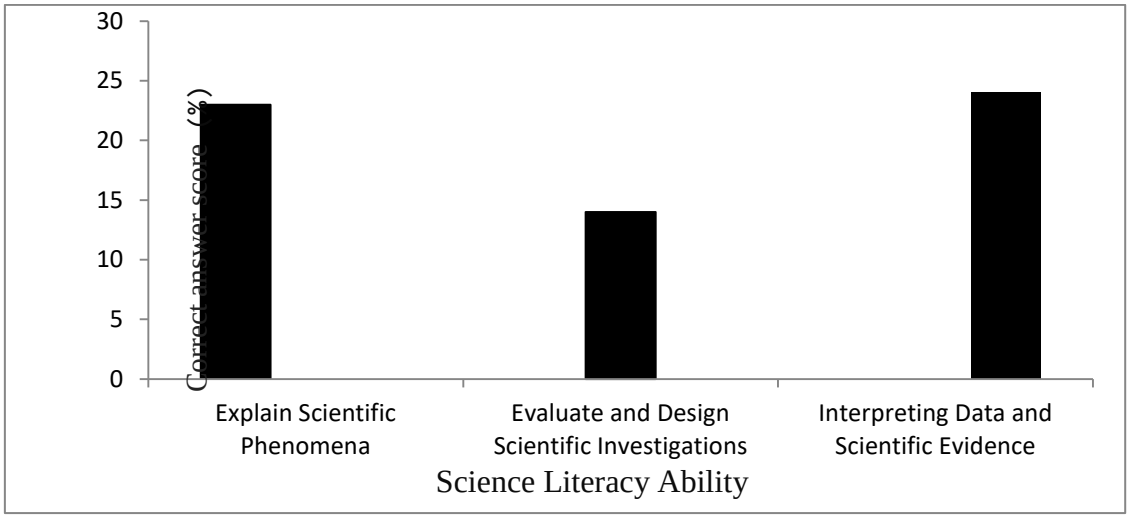

Figure 1. Distribution of Score Points Samples With Correct Answers

From this figure, it can be seen that from the three components of scientific literacy the ability to interpret data and scientific evidence has the correct answer score with the highest point and dominates from all the components. this shows that the scientific literacy ability of students is more likely to choose to facilitate data and scientific evidence. The ability to evaluate and design scientific investigations is inversely proportional to the ability to interpret data and scientific evidence that has the lowest answer score of the three components.

Literacy skills in youth will be presented based on an assessment of the level chosen by PISA in the distribution of score points that answer correctly from high, medium, and low levels. Each score has a different score. This assessment refers to the cognitive level that can be achieved by students. In Figure 2 will show the distribution of scores obtained from each group.

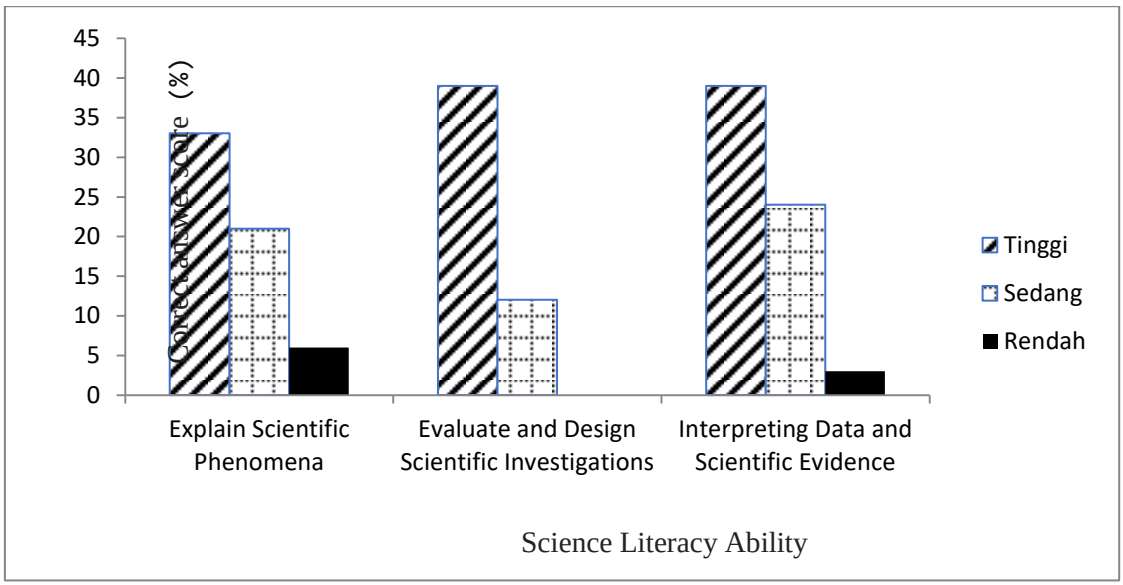

Figure 2. Science Literacy Ability in High, Medium and Low Groups

From this figure, it can be seen that high-level groups dominate all aspects of the scientific capacities of science. In the medium group, the one that dominates the most is the ability to interpret scientific data and evidence. In the low group all aspects of scientific literacy ability are at the lowest level, even in the ability to evaluate and design scientific investigations there is no correct answer score. From this figure, we can see significant data gaps between the high and low groups. This happens because of students' interest in learning in low groups that tend to be low. This is seen during the learning process, students tend not to listen to learning. Activities carried out by low-group students often sleep in class during the learning process. High groups are more likely to be active during the learning process, active in answering questions and actively asking questions when there is some material that is poorly understood. In the medium group is more likely to follow the flow of the high group, when the high group asks students the group is listening while the teacher explains. This is the cause of the gap between the score results in the high and low groups when answering questions about scientific literacy. This is supported by research Astuti et al. (2012) Indeed, in reality in the field, groups of students whose cognitive learning outcomes have decreased have high

intelligence, but interpersonal interactions and their application of knowledge to life are relatively lacking. So the value of peer assessment and projects is low. That is, they have not been able to apply aspects of scientific literacy in their daily lives.

Scientific Attitude

The scientific attitude that will be examined in this study there are three aspects, namely curiosity, thorough and critical thinking. The results of the research on all three aspects have the same criteria, namely in the good category. But students tend to prefer and have a scientific attitude that is curiosity. The results can be seen in Figure 3.

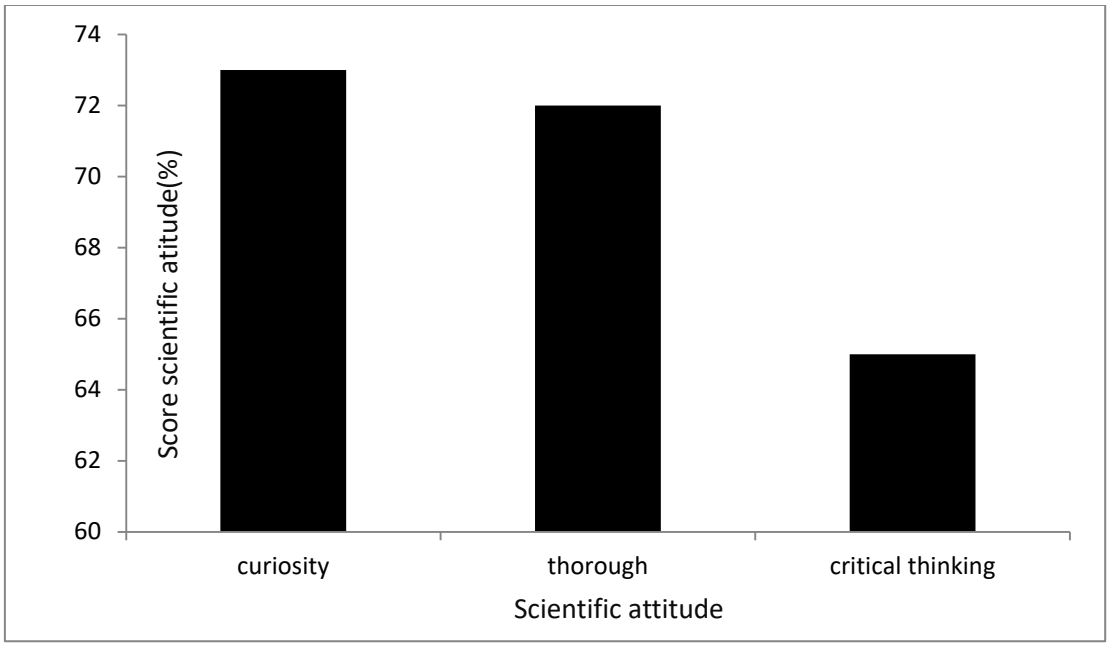

Figure 3. Scientific Attitude Ability

From the figure it can be seen that the score at the point of curiosity dominates from all three aspects of scientific attitude. Critical thinking attitude has the lowest score compared with three other aspects. Problem liteai science tested to students therein inserted with some scientific attitudes such as curiosity, thorough and critical thinking. After working on the questions the students were given a questionnaire about the scientific attitude of students. From the results of the questionnaire that has been filled out by students, at the question points about explaining the problems that occur in phenomena in everyday life. The students had difficulty in answering these questions. In this matter has been inserted with the scientific attitude of critical thinking about problems that occur in phenomena in everyday life. Holbrook et al. (2003) that "science will be easy to learn when what is learned makes sense in students' views and relates to human life, interests and aspirations". This shows how students' critical thinking attitudes get low results. In the attitude of curiosity many students answered correctly in filling out questions and questionnaires. Experimental activities carried out during learning function as a place to gain knowledge, where students are invited to search, try, and obtain their own concepts in groups so that students can discuss and find concepts that are sought for later discussed in the context of maturation of these concepts (Brickman et al., 2009).

The Relationship Between Science Literacy Capabilities and Scientific Attitudes

Figure 3 shows that Bandungan 1 N SMP which has the lowest scientific literacy

value turns out to be almost the same as the scientific literacy ability of SMP N 2 Bandungan and MTs Sudirman Jimbaran which have a higher scientific literacy value.

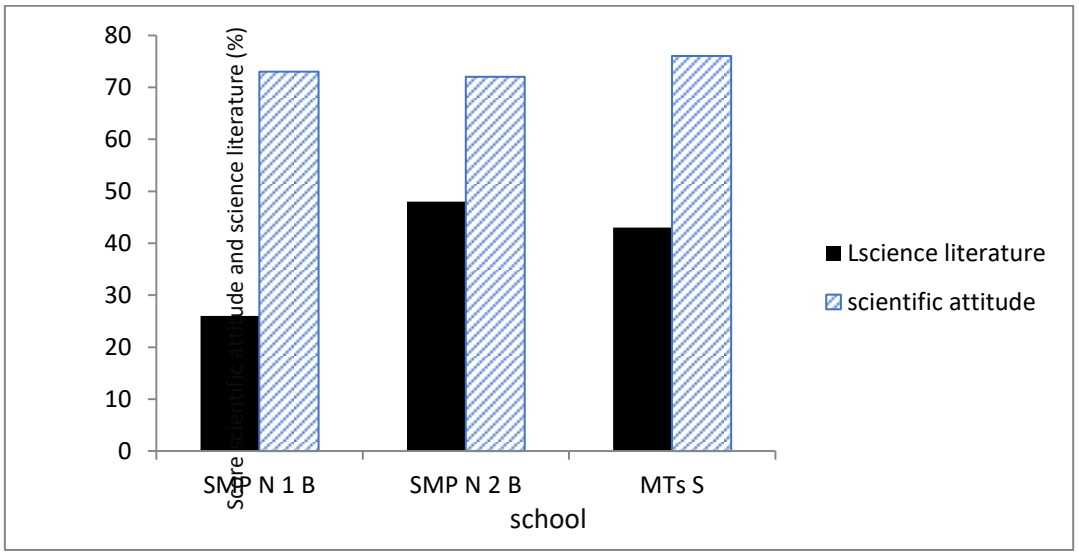

Figure 4. Average Sains Literacy Ability and Scientific Attitudes

From Figure 4 it can be seen that the scores in SMP N 2 B dominate for students' scientific literacy abilities. As for the scientific attitude of students dominated by MTs S. From these results it is known that the school that has the highest score on scientific literacy ability is not directly proportional to the student's scientific attitude. At SMP N 1 B shows the results of a high scientific attitude but is inversely proportional to the literacy ability of students who show the lowest results among the three other schools. This happens because the junior high school N 1 B has not been used to apply the literacy process in learning activities. It is known from the results of the initial interview with the teaching staff who teach at the school. From the results of these studies the data obtained by researchers have not yet reached the targets set by OCED which can be seen in Table 1

Table 1. Comparison of OECD Score Score Distribution and Research Results

Comparison	Explain Scientific Phenomena %	Evaluate and Design Scientific Investigations %	Interpreting Data and Scientific Evidence %
OECD Research Target	40-50 23	20-30 14	30-40 25

The scientific literacy ability of students for all samples in SMP and MTs shows a value below 50. Compared to the minimum completeness criteria standard (KKM), science subjects are also below the KKM standard of 75. This means that the implementation of the 2013 curriculum that promotes science learning has not yet played a maximal role. The ability of scientific literacy is included in the core competencies that must be achieved by students. Science learning activities certainly have a corresponding ability indicator so that students have good scientific literacy skills.

Selcuk's research (2010) also states that the activities of experimentation and discussion have an important role in supporting students' intellectual development. The calculation results show the correlation value r = 0.006 when compared to r table for n = 90 and error 1% then r table = 0.176, while r count is 0.006. This means that r count is smaller than r table, if viewed from the level of the relationship of interpretation of the correlation coefficient, the relationship between scientific literacy ability and scientific attitude ability of students is very weak. The higher the scientific literacy test scores of students is not necessarily the ability of a high scientific attitude. However, on the contrary, low scientific literacy test scores are not necessarily low on students' scientific attitude abilities. This is of course there are several factors that affect the relationship between the two capabilities is very low.

CONCLUTIONS

Distribution of scores of students who answered correctly on the tests of scientific literacy abilities below the average target distribution points set by the OECD. The average value of scientific literacy ability per school is less than 50 and is included in the category of less. This explains that the situation of students in literacy activities especially science is still low. The fact is the change in the Education Unit Level Curriculum (KTSP) into the 2013 Curriculum which includes core competencies related to science learning is less successful in increasing students' scientific literacy abilities.

The average value of students on the ability of scientific attitudes in three schools based on the results of the questionnaire that is 64-75 with the average category is high. This means that students' awareness in the high, medium, and low groups is good starting from preparing the learning materials needed, reading the discourse on the problem, to evaluating themselves after finishing solving the problem. Based on the calculation of product moment correlation from a sample of 97 students, the relationship between the ability of scientific literacy and the ability of scientific attitudes with a value of r = 0.006. This is because students are not accustomed to science literacy activities, so the value of students' scientific lietaration is low, while the ability of scientific attitudes of students tends to be high.

ACKNOWLEDGEMENT

Some suggestions can be made, including: need to provide motivation to motivate students in carrying out scientific literacy activities. More in-depth research is needed related to scientific literacy skills and scientific attitudes. The results of this study are expected to increase the repertoire of knowledge in the field of learning and subsequently can be used as a reference for researchers who wish to further research.

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