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PREFACE

Assalamu'alaikum warahmatullah wabarakatuh

It is my pleasure to be able to bring the International Conference on Mathematics and Natural Sciences Proceeding to our readers. It took an extra effort, time and patience to accomplish this proceeding and it involved reviewers from all over regions. I personally thank to our reviewers and subsequently apologize for the delay in making this proceeding available for you to read. It is largely due to the inevitably extensive reviewing process and we persist on our initial idea to keep the proceeding both readable and academically meet a higher standard.

This proceeding is presented in six sections: 1) Invited Speakers; 2) Physics; 3) Mathematics; 4) Biology (including pharmacy and agriculture); 5) Chemistry; and 6) General Education. All sections consist of papers from oral and poster presentation in respective subject, including science and science education.

I hope that this proceeding may contribute in science and science education.

Wassalamu 'alaikum warahmatullahi wabarakatuh

Lalu Rudyat Telly Savalas

Chief Editor

OCE-07

The Effects of Chemistry PISA Model Teaching Material toward Student Scientific Literacy at SMP/MTs in Palembang

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Abstract- This research has been conducted to the eighth graders at 3 junior high schools by using teaching materials of chemistry science based PISA. The teaching materials of chemistry science based PISA is intended to enhance the students' scientific literacy. Scientific literacy is defined as the ability to use the science to identify questions and draw conclusions based on the evidences in order to understand and make decisions regarding the nature and the nature changing through human activity. The data collected through pre -test, observation and post test. Result concluded that the teaching material chemistry science based PISA increased the eighth graders' scientific literacy.

Keywords: Science, chemistry, teaching material, PISA, literacy.

1. Introduction

The Curriculum 2013 for Junior High School required that the learning activities for all levels and all subjects achieve attitude competency, knowledge, and skills, in all learning process. In order to implement the Curriculum 2013 for Junior High School, it would require an innovation in the planning learning processes and learning approaches. Mathematics and Natural Sciences were very basic subjects to be well understood by students. Mathematics and Science needed to be given to all students from elementary schools in order to prepare them to have the skill to think logical, analytical, systematic, critical, creative, and cooperate. All of these skills can be trained by the activity that led to the development of scientific thinking skills, for example through the activities that trained students gain knowledge, manage knowledge, and use information. It took students' ability to survive in the changing circumstances, uncertain, and competitive. One of the instrument or learning approaches that can be developed for mathematics and science is teaching learning PISA-based. *Programme for International Student Assessment* (PISA) is an international assessment of the skills and abilities of students at age 15 (Shiel, et al., 2007; OECD, 2009). PISA is a collaborative effort to measure the extent to which students age 15 could face the challenges or solve real problems in this era (OECD, 2003; OECD, 2011). There are three types of literacy measured in PISA, namely reading literacy (reading literacy), mathematics literacy (mathematical literacy), and scientific literacy (scientific literacy) (OECD, 2003; Stacey, 2011). However, in PISA 2012 there were additional evaluation that were the problem solving literacy (problem solving literacy) and financial literacy (financial literacy) (OECD, 2013). PISA itself carried out every 3 years (Prenzel, Kobarg, Schöps, & Rönnebeck, 2013).

PISA suggested that, Natural Science Literacy defined as the ability that used natural sciences to identify questions and draw conclusions based on the evidences in order to understand and make decisions regarding the nature and the changes made to the nature through human activity. In the aspect of measurement, natural sciences literacy is divided into three dimensions, namely content, process, and the application context of natural science.

Emiliannur (2010: 1) said that PISA divided natural sciences literacy into concept and process. In scientific concepts students needs to captured a key concept/essential to understand certain natural phenomena and changes that occur as a result of human activity. This was a great idea that explained aspects of the physical environment. PISA asked questions that unites the concepts of physics, chemistry, biology, and earth and space science (IPBA). In the process, PISA accessed the ability touse scientific knowledge and understanding, such as the student's ability to

find, interpret and treat the evidence. PISA tested five processes, namely: recognized scientific questions, identified evidence, draw conclusions, communicated conclusion, and demonstrated understanding of scientific concepts.

On the implementation of PISA 2000 to 2009, one of the three literacy was considered a major focus (Wetzel & Carstense, 2013), while the other became a companion literacy. The cycle started from PISA 2000 on reading, PISA 2003 on mathematics and PISA 2006 on science. PISA 2009 started with the new cycle, that reading was the main focus. Indonesia's participation in the International Trends in International Mathematics and Science Study (TIMSS) and the Programme for International Student Assessment (PISA) in 1999 also showed that the achievement of Indonesian children were not encouraging in recent times report released TIMSS and PISA (OECD, 2013). Because the amount of tests questioned in the TIMSS and PISA were not include in the curriculum of Indonesia. The average score of Indonesian students in math and science in the Programme for International Student Assessment (PISA) were still low. This indicated the low quality of students.

Learning essence of science (IPA) was the way to get the truth of what we already know. The values of IPA included in science learning proposed by Laksmi (cited in Prasetyo, 2011: 15) skills to work and think regularly and systematically according to the steps and the scientific methods; skills and proficiency in conducting observations, experiment using tools to solve problems; and have the necessary scientific attitude in solving problems both in terms of sciences and life lessons.

Learning activities science included the ability to develop questions, to seek answers, to understand the answer, to complete answers about "what", "why" and "how" of natural phenomena and the characteristics of the natural surroundings through systematic ways that would be implemented in the environment and technology. The activity is known as the scientific activities that were based on the scientific method. Process skills developed attitudes and values which include curiosity, honesty, patient, open, critical, determined, tenacious, meticulous, disciplined, caring for the environment, pay attention to safety, and to cooperate with others (Prasad, 2011: 3). There were three abilities that could be developed in the learning of science, namely: the ability to know what is observed, the ability to predict what has not happened, and the ability to test the follow-up results of the experiment, and the development of a scientific attitude. Scientific literacy could be developed in students who undergo a process called the scientific process. When the students in a science process, they were also in a mentally process to shape their attitudes when a problem raised and involved themselves to resolve that problem.

Based on the background mentioned, it has been designed and developed teaching materials in accordance with the PISA criteria, valid and practical (Somakim et al, 2014). It is a set of materials systematically arranged displaying the form of competence to be achieved. It consisted of knowledges, values, attitudes, actions, and skills that contains messages, informations, and illustrations in the form of facts, concepts, principles, and processes which is related to the subjects to achieve the goals. The problem was the teaching material that had been developed had been tested in a small scale. Based on that problem, the researchers did the research in some SMP in Palembang. The objective of this research was to find the effects of literacy science from the PISA teaching material.

2. Method

The teaching material application did by the subject teachers at the school that became the object of this research. Before the research, the teachers did the training to get to know, understand, and be able to teach using the PISA teaching material that had been prepared. The training attended by mathematics and science teachers of SMP accredited A and B. In the Figure 1, the researchers pictured with teachers who will implement PISA-based science teaching materials.



Figure 1. The researchers and teachers took picture at the training

As a junior high school representatives accredited A was SMP Muhammadiyah 1 Palembang, and as a junior high school representative accredited B was SMP Srijaya Negara. The training started with pretest, then the IPA teachers taught IPA, followed by mathematics teachers taught mathematics, with the previously IPA teaching material used to apply in the case of mathematics teaching material basedon PISA. During the learning process, the researchers observed both teachers and students. The amount of time spent on research was 10 hours of meetings. Posttest conducted at the end of the training. Figure 2 showed the students were undergoing a learning process based on PISA science.



Figure 2. (a) the students did pretest, (b) the students tried to produce sweat,(c) the students collected data of sweat

Figure 2 (a) showed the students conducted a pretest of "Sweat". Questions about sweat included chemical aspects, in addition to aspects of biology, physics aspects and mathematics aspects. Time used in this process about 1 hour meeting. Figure 2 (b) showed a student in each group tried to produce sweat, they did run in place within a certain time. Figure 2 (c) showed the students took the data about the sweat after their member of group ran; the appearance of sweat, the sweat location, the body temperature, the acidity characteristic of sweat. This ran in place activities and data collection did in several times. Once the data is collected, the students continued learning in the form of discussion to apply the data collected to explain the phenomenon of sweat from the chemical aspects and other aspects, as shown in Figure 3 below.



Figure 3. Group of students discussed about the data collected by each groups.

Figure 3 shows that each groups had a group discussion about the data collected. Each groups had a different data, since the data of the sweat came from different students. In the discussion of each groups of students tried to make sense of the data to draw conclusions. In chemistry material, the data obtained is directed to determine the acid-base properties of sweat and sweat chemical components.

The data from the pretest, observation, and posttest were analysed qualitatively. The results of the analysis of the data routed to see if the science and mathematics teaching material based PISA had been prepared, especially those related to chemistry materials rised the students scientific literacy.

3. Result and Discussion

Results of this research on the effects of teaching materials chemistry models to the PISA scientific literacy is shown in the following table:

Tabel 1. The mean of Pretest dan Posttest SMP students learned chemitry teaching material based PISA

NAMA SEKOLAH	n	Mean pretest	σ	Mean posttest	σ
SMP SRIJAYANEGARA	37	42,64	3,52	63,34	2,23
SMP MUHAMMADIYAH 1	35	50,25	3,21	81,22	2,01

Based on Table 1 above, an increase in the score of learning outcomes in both schools, after students have learned to use science based teaching materials based on PISA. Before they learned chemistry teaching materials based on the PISA, the students had an average score of 42.64 and 50.25; after the research the average score of SMP Muhammadiyah 1 is 63.24 and SMP Srijaya Negara is 81.22. The score increased at SMP Srijaya Negara students is 50% and the score increased at SMP Muhammadiyah 1 Palembang students is 61 %.

The learning result obtained due to the student got the science teaching material based on PISA in which the teaching materials the students experienced learning process to develop their knowledge competencies, attitudes and skills at the same time. The learning process started with an experiment that produced sweat. A student ran in place, the other student recorded the data, the other student observed the sweat that arise, the other measured runner's body temperature, the other set starts and stops running. All members of the group worked and collaborated. The data recorded

will be discussed and agreed upon. Changes and phenomena that arise were discussed together. This activities carried out such experiments that fostered the spirit of cooperation, tolerance, in addition improved students' skills in using tools and collecting data, and understanding data.

The learning outcome is likely to be further improved. It is based on observations during the learning processes, still allowing a better result, if students are invited to become more involved in the learning processes. In the process of learning, many students were still waiting for the instructions of the teachers, although LKPD give students the freedom of creativity in their activity. Similarly, the role of the teacher looked dominant in directing the process, and in directing the conclusion. The dominance may be one cause reduced the creativity of students, although it can be a result of students who are still accustomed to waiting for the hint. Thus the PISA -based teaching materials would be suitable if the student is already accustomed creative or creative. Teaching materials based PISA requires students willing to involve themselves physically and mentally for the experiences and learning pprocesses. This creates larger and more complex opportunity of teaching materials using natural science of students that have to be used in the natural sciences. This teaching material builds natural sciences students have contextually and constructively.

The implementation of the chemistry teaching material based on PISA using the better methods or learning model that enables developing science skills. This study used activities that enable the development of science skills, but still needs to be improved as has been suggested in the curriculum implementation model 2013. The model suggested in the 2013 curriculum, the model PBL (Problem Based Learning), Discovery Learning and Project base learning. In the three models in the application of students experiencing learning process that involves physical and mental components. After experiencing the learning process the students identify a mechanism to find an outcome study. Habituation mechanisms in finding an outcome of this study are very useful in everyday life. This will imprint and if it will make students be familiar scientific thinking, scientific attitude, and act scientifically. If students become so, then the purpose of studying teaching material based on PISA will be achieved.

4. Conclusion

Based on the discussion above the researcher concluded that the teaching material science chemistry based on PISA has increased the eighth graders' scientific literacy.

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