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The Effectiveness of Context and Creativity Based Learning Models as an Effort in Improving Scientific Literacy at Elementary School

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Abstract: ***This was a research and development study to develop context and creativity based learning models in improving scientific literacy for 5 th grade elementary school students. The instrument was validated by experts.The instrument used in this study was a scientific literacy test. Interviews were analyzed with descriptive qualitative, whereas test were analyzed by descriptive quantitative test. This Studi used SPSS 20 to calculate the data. This Studi used SPSS 20 to calculate the data. Based on the analysis, The Mann Whitney score was Asymp. Sig. (2-tailed) 0.23 meanwhile the probability value was 0.05. The null hypothesis was rejected because t-observes was higher than 0.05. It implied that context and creativity based learning models was effective to improve scientific literacy in elementary students.***

Keywords: context and creativity based learning, scientific literacy

1. Introduction

Two things that need to be highlighted in order to face the future challenges are related to free trade such as World Trade Organization (WTO), ASEAN Community, APEC (Asia-Pacific Economic Cooperation) and low score of scientific literacy. The result of the 2012 PISA (Program for International Student Assessment) shows that Indonesian students are in 64th ranked out of 65 countries with an average score of 375, while the international average score is 500 (OECD, 2013). According to Laugksch (2000), there is a strong relationship between the ability of scientific literacy and the economic development of a country. A society who has an objective, processed, and capability in science will be able to supply qualified scientists, engineers and experts which will ultimately be able to improve the economic level of the country.

Scientific literacy is an important element in science technology education of modern society and it is crucial for all citizens, not only for those who study or work in science field (Phearson, 2008). Day by day, world issues related to science and technology are more and more and every member of society is required to be able to participate actively in the discussion and involved in the decision-making process to solve the problem.

Students need to know the relevance of a teaching process, as in daily life or its relevance to social life. Thus science education is expected to guide the students to achieve their goals in education through science. It is important for students to be more appreciate the important of science in their education life (Holbrook, 2005).

The problem of science learning, which until today has not got a complete solution is the students' assumption that science is difficult to understand. This is in line with a research conducted by Holbrook (2005) which shows that science learning is irrelevant in students' views and it is disliked by the students. The main factor of all these realities is the lack of connection in the teaching of science. The emphasis of understanding basic concepts and basic understanding of science is not linking to the things related to the context in their everyday life.

In a contextual-based learning approach, context is used as a starting point for developing scientific thought (Bennett, Lubben & Hogarth, 2006; Ramsden, 1997). The main goal of a contextual-based approach is to present scientific concepts for students through daily activities that were chosen, which are able to increase their motivation and interest in learning science (Barker and Millar, 1999; Kose and Tosun, 2011). During the building context by doing experimental activity, students use materials that are easy to use and available at their home.

Problem solving activities require creative thinking ability, because in searching idea for solving a problem it is necessary to use the knowledge even in a new unknown situation. The development of students in science learning is not only about mastering the understanding of concept and process skills, but also how they think creatively. These developments can be facilitated by providing challenges that emphasize to the problem solving process (Suratno, 2009).

This research conducted to develop a learning model that in its stages enables students to solve problems based on the context, then conducts experiments or lab work to build a concept and develop it to be applied in the new concepts that

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enable to become a scaffolding in learning science and arguing.

The general objective of this research is to get a contextual-based learning model of science and creativity that is able to increase students' science literacy. The specific objectives are: 1) Obtain the final learning model (tested model), teaching materials and science literacy assessment at the elementary school level. 2) Assess the effectiveness of the application of learning model to the science literacy ability.

2. Research Method

This research uses a small scale educational research and development model that includes the following steps: 1) Preliminary Study, 2) Model Development, 3) Model Test / effectiveness test. The preliminary study was carried out by literature study in the 5th grade elementary school curriculum analysis in science subject, analysis of students' ability in content and appropriate context, and the study of creativity literature and science literacy.

Preliminary test is done by interviewing the 5th grade elementary school teachers to investigate the implementation of science lesson in elementary school as a material of model development. The detailed research stages are presented in table 1 below.

To know the efficiency and effectiveness of learning process developed, a scientific study by using quasy experimental design is conducted with one group pretest-posttest research design:

O	M	X_1	O_1

Information:
O = Initial test
O_1 = The final test after the treatment is given to determine the development of student science literacy.
M = Subject of research
X_1 = Treatment, in the form of learning process in schools with the chosen method.

Statistical data is processing by using SPSS 20 to see the effectiveness of the developed model. An open interview was also conducted to three elementary school teachers to find out the teacher's response to the developed model.

3. Results and Discussion

In this section, the results are based on the research objectives that have been stated in the introduction. The first objective is to get a contextual-based learning model and the second objective is to obtain information on the effectiveness of the developed model.

3.1. Results

3.1.1. Contextual and Creativiy Based Learning Model

Contextual and creativity-based learning model that have passed the validation stage and the limited and broad trial consisting of 5 learning syntax, they are:

1) Contact stage
2) Exploration stage
3) Experimental stage
4) Concept discovery stage, and
5) Presentation of creative tasks stage

This model synergizes with created teaching materials, starting from the question to stimulate the students focus on the problem carried out in groups with creative lab work based. The title of the teaching materials given to the students is "Why Our Teeth Can Be Sick?". Introduction to the materials in the form of paragraphs that contain problems about the teeth. Here is the paragraphs which are presented at the beginning of the teaching materials:

Our body is made up of many united parts which forming become a harmonious unity. These parts of the body work together to serve the needs of humans in the activities of daily living. One of the most important organ roles is our teeth. Teeth are coated by the hardest material that exists on our body, but why is our teeth can be broken and hollowed?

Students then explore questions with guided by teaching materials about teeth, tooth structure and then carry out a simulation experiment on tooth decay. Experimental guides are developed as presented below.

Why brushing our teeth before sleep is important?

Tools and materials needed:
A. 4 boiled eggs (or raw)
B. Soft Drink (Cola)
C. Water
D. Vinegar
E. Flouride (from toothpaste)
F. 4 mineral water plastic glass

Work steps
Activity 1
A. Prepare 3 mineral water plastic glass, then put water, soft drinks and vinegar in each glass.
B. Put the egg into each glass.
C. Save for overnight (12 Hours).
D. Observe what happens with the eggs on each glass.

After you have done both experiments above, try what you can conclude.

After students doing a lab work about tooth decay simulation, students find the concept of why their teeth can be hollow by themselves, and find their own ideas how to keep their teeth healthy and pour it on the poster as a form of their creativity in proposing how to keep the teeth from cavity.

3.1.2. Students' Science Literacy Skills Improvement

After the data is collected, the next step is processing the data. To see the effectiveness of the developed model, it is used significance test with normality and homogeneity test first. Normality and homogeneity test results are presented in tables 2 and 3 below.

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Table 2: Normality Test Results

	Normality Test Kolmogorov-Smirnov[a]		
Group	Statistic	Df	Sig.
pretest	0.965	31	0.401
postest	0.928	31	0.039

a. Lilliefors Significance Correction
*. This is a lower bound of the true significance.
0.401 > 0.05 and 0.039< from 0.05 abnormal data distribution

Table 3: Homogeneity Test Results

Levene Statistic	df1	df2	Sig.
1.979	8	20	0.103

0.103 > 0,05 data homogeny

Due to the abnormal and homogeneous distributed data, so that non parametric statistic test is used to test a treatment. The results of the significance test are shown in table 4 below.

Table 4: Significance Test Results

Mann-Whitney U	320.000
Wilcoxon W	816.000
Z	-2.272
Asymp. Sig. (2-tailed)	0.023

Based on Table 4, Asymp significance value. Sig (2-tailed) is smaller than probability value 0.05 then hypothesis H1 is accepted. The conclusion that can be taken from table 4 is that there is a difference between pretest and posttest results after the application of contextual and creativity-based learning model to the students.

3.2. Discussion

In this research, a laboratory work based model is developed with the purpose that science lab work can be easily implemented in elementary school level with a context known by the students so that science learning is close to their everyday life. Students are finally able to link the context and discover their own concepts as the foundation of the scientific literacy achievement proposed by PISA that identifies scientific questions, explains phenomenon scientifically, and uses scientific evidence (OECD, 2006; OECD, 2009).

Based on the calculation of significance test in Table 4, using Mann-Whitney and Wilcoxon test with Asymp. Sig (2-tailed) value that is smaller than probability value 0.05, so hypothesis H1 is accepted and H0 is rejected. This means that there are some differences in students' science literacy skills before and after the introduction of contextual and creativity based learning in elementary schools.

According to Witte and Beers (2003) the examples of contexts can be environmental issues, problems that can be met daily, science problems, and school problems. The contextual-based approach focuses directly on the daily activities and relates to an event, concept, or science topic in the form of a context. Selection of appropriate context and teaching style will help to keep students' attention in the learning process (Unal, 2008).

In PISA, there are three scopes of context such as personal (self, family, and group), social (community), and global (life between worlds). The Context "Why Our Teeth Can Be Sick?" Is part of the personal concept. Keeping teeth is a problem that is considered simple but many people ignore it by brushing the teeth rarely, eating foods that contain lots of sugar, and so on. In the end, the outer layer of the tooth which is actually very hard (email) will be damaged. If the email layer is damaged then the tooth will be hollow and if it comes to the nerve, the tooth will felt hurt. If it is ignored for too long, it will cause other health problems.

Contextual learning is a learning that refers to contextual theory. According to contextual theory, learning occurs only when students process the information or knowledge in such a way that the information becomes meaningful for their self.

Contextual theory-based learning is a learning concept that emphasizes the relationship between learning materials with the real life, so that the learners are able to link and apply the competencies of their learning outcomes in their everyday life. Contextual learning experiences will build literacy competencies where students are able to explain and apply the concepts in the various forms of phenomena that occur in their environment and propose solutions to problems related to the concepts which are studied in the classroom. Contextual learning will create an effective and meaningful learning for students.

Based on the open interviews results with three 5th grade teachers, it is found that teachers are interested in applying this model and want to try to develop the teaching materials in context related to the students' daily activities which include in the existing curriculum. Teachers also stated that they are rarely to do a lab work because the lab work is considered difficult and it is not easy in terms of preparing materials, as well as to conditioned the students. If the lab work can be practiced simply by using materials found in everyday life, then the lab work will be easier to do.

Contextual lab work is appropriately implemented in elementary school when it is viewed from the ability of elementary school students. According to Piaget, elementary school students are at concrete operational phase. It is said in Dahar (1996), the concrete operational phase is coming at 7-11 years' age and it is the beginning of rational thinking for a child. At this phase, child is able to think logically that can be applied to concrete problems, which means that the child will be able to solve the problems that previously could not be solved properly.

This lab work is also developing the student creativity as the final product of the concept developed. Students creativity is needed to be developed because through creativity, they can actualize their self(self-actualization), give their own satisfaction (satisfaction), and through creativity, it will be able to improve the quality of human life (Safilu, in Arwita 2013). In the context of education at school, Arwita (2013)

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proposes the definition of creativity-based learning as a process that develops the capacity to acquire ideas.

Creativity-based science learning emphasizes to facilitate the students to create new ideas that are effective and ethical (having meaning and value). In this case, creativity is not just about new ideas, but how these new ideas can solve problems effectively (useful) and also have ethical values (appropriate, with no normative problems).

4. Conclusion

Context Based Learning Has Been Generated To Improve Student Science Literacy. Stages of the Learning Model Consisting of 5 Stages Namely 1) Context Stage, 2) Contact stage, 2) exploration stage, 3) experimental stage, 4) concept discovery stage, and 5) presentation stage of creative task. based on the results of that study that context and creativity based learning models was effective to improve scientific literacy in elementary students.

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