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RESEARCH ARTICLE

EFFECTIVENESS IS SAINS WORKSHEET-BASED STS (SCIENCE TECHNOLOGY SOCIETY) TO TRAIN THE CREATIVE THINKING SKILLS OF JUNIOR HIGH SCHOOL STUDENTS.

Weni Eka Wahyuni, Jekti Prihatin dan Agus Abdul Gani.
Department of Post Graduate Science Education, Jember University, East Java, Indonesia.

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Abstract

The 21st century demands the students to develop thinking skills, one of which is the ability to think creatively. Study results from the PISA year 2015 show that scientific thinking skills students are still low. One approach to learning that can be used to train the ability of creative thinking is learning approach to STS. It is said to be effective when supported with learning materials be worksheet. The purpose of this research is to know the effectiveness of sains-based STS is worksheet to train creative thinking skills of students of Junior High School. The research design used was pre-experimental in form of pre-test post-test non-equivalent design. Based on the results of test effectiveness, then it is known that the N- Gain on each of the meetings has increased with the average value of a meeting 1 of 0.5, 0.6 and 2 meetings of the meeting 3 of 0.6. Creative thinking skills of students tend to experience increased every charge indicators will namely indicators think smoothly on the 1st and 2nd meetings of the 3rd meeting of 0.4 and 0.5. Indicator flexible thinking in the 1st and 2nd meetings of the 3rd meeting of 0.4 and 0.6. The indicator think original confluence of 0.3 and 1 meetings 2 and 3 amounted to 0.5. The indicator think detailing the meeting 1 of 0.3 and meetings 2 and 3 amounted to 0.4. Based on the research that has been done, it can be concluded that-based STS is worksheet as having been effective in training the creative thinking skills of students of Junior High School.

Introduction:-

Today in science and technology is evolving rapidly, so that students can master the various skills required in order to be globally competitive. Education can develop a variety of skills of the 21st century, such as thinking skills and problem-solving skills (NSTA, 2011). Generally describe the thinking skills ability, knowledge and skills that must be mastered students (Draghicescu et al. 2014). One of these is the thinking skills of creative thinking skills (Devies 2013 et al.).

Creativity most of the time is synonymous with success (Cleveland. 2018). Creativity in the science of psychology is defined as the ability to think differently, be sensitive to a problem, the ability to solve problems and find solutions that are not of these problems (Runco & Jaeger. 2012). Guilford in Humble et al (2018) stated there are four main components of the creative thinking skills which include: fluency (smooth), flexibility (flexibility), originality

Corresponding Author:- Weni Eka Wahyuni.
Address:- Department of Post Graduate Science Education, Jember University, East Java, Indonesia.

(originality) and elaboration (elaboration). Fluency is the ability to generate a lot of ideas; flexibility is the ability to generate ideas that vary; originality is the ability to generate new ideas or ideas that previously did not exist, and elaboration is the ability to develop so that it produced detailed ideas and details.

In fact, Indonesia students thinking skills still belongs to low, in particular in the field of science. Low ability students can be seen from the results of the PISA (Programme for International Student Assessment) and TIMSS (Trends in International Mathematics and Science Study). The latest PISA results year 2015, science students are in Indonesia ranked 62 of 69 participating countries with an average score of 403, still below the International average score i.e. 493 (OECD, 2015). Conditions that do not look much different from the PISA 2012 science students in Indonesia, ranked 64 out of 65 countries with an average score of 382, where the average score 501 (OECD, 2014).

PISA and TIMSS study results indicate that a thinking skill are still low, the students don't have the skills to become a creative thinker and problem solver. The potential creativity of students depends on good communication between students and teachers (Davies, 2013). Most teachers still widely apply to conventional learning, where learning is generally only coached the convergent process of thinking so students can not solve problems creatively (Munandar, 2009). Teachers need to use an approach that is able to train students to think creatively and can be connected with everyday life. One approach to learning that can be used is STS learning approach (Smitha and Aruna, 2014).

Study of STS (Science Technology Society) is the integration of science, technology, and society that will be able to develop awareness of the importance of science attitudes (Klahan and Yuenyong, 2012). STS can be developed in associated with the environment, so as to realize that presents real-world learning and experienced students in everyday life (Bettencourt et al. 2011). In addition to the use of the proper use of learning approach to learning materials play a role that is essential to generate the effectiveness of learning activities, one of them by using the student Worksheet (Lee. 2014).

Student worksheet is print learning materials in the form of a sheet of paper that contains content, summary, perform the instructions refer to the competencies to be achieved (Prastowo. 2015) But mostly Worksheet in use today have yet to facilitate students in developing their creative thinking ability. Though worksheet a work containing should make students actively in the learning process (Lee, C.D. 2014).

The material presented in this material is worksheet STS is environmental pollution which includes material water pollution, air pollution, and land pollution. The selection of such material because the material is directly related to everyday life. In addition, the material environmental pollution can be taught using STS, i.e. Science in discovering the concept, in terms of technology can be described by explaining the various applications of the technology associated with the material, and related community with something or tools of benefit to human beings.

Based on preliminary research conducted against teachers and students aware that 90% of the teachers stated have been using worksheet, which worksheet that use contextual material presents yet related science, technology, and society that implies enhancement of creative thinking of students. Therefore, the need to do research to find out the effectiveness of STS-based worksheet AS useful to train creative thinking skills of students of Junior High School.

Research Methods:-

The research design used was Pre experimental in form of pre-test post-test non-equivalent design. This design is used to view the progress of the students after learning by using STS is worksheet. The data in this study were obtained through a test instrument, in the form of questions addressed to the students. Activity analysis of data from the test of the effectiveness of activities carried out using descriptive qualitative approach. Data for the analysis of the results of research conducted test N-Gain:

$$\text{N gain} = \frac{skor\ pos\ tes - skor\ pre\ tes}{SMI - skor\ pre\ tes}$$

Description:-

SMI = Maximal Ideal Score

The results of calculation N the gain is then interpreted using criteria such as in table 1.

Table 1:- Criteria gain score

Skor gain	Kriteria

G < 0.3	Lower
0.3 ≤ g < 0.7	Are
G ≥ 0.7	High

(Meltzer,2002)

Results And Discussion:-

Effectiveness-based STM is worksheet to train creative thinking skills of Junior High School students of one class. The test was conducted to find out the effectiveness of the increased value of pre test and post-test, know the value of the average of each of the meetings, as well as an increase in creative thinking skills of students. The average value of pretest and post test each meeting can be seen in table 2.

Table 2:-Average test result N-Gain

Meetings 1			Meetings 2			Meetings 3		
Pre tes	*Pos tes*	*N-Gain*	*Pre tes*	*Pos tes*	*N-Gain*	*Pre tes*	*Pos tes*	*N-Gain*
27,4	64,9	0,5	36,1	75,2	0,6	34,1	76,5	0,6
Kategori		Sedang			Sedang			Sedang

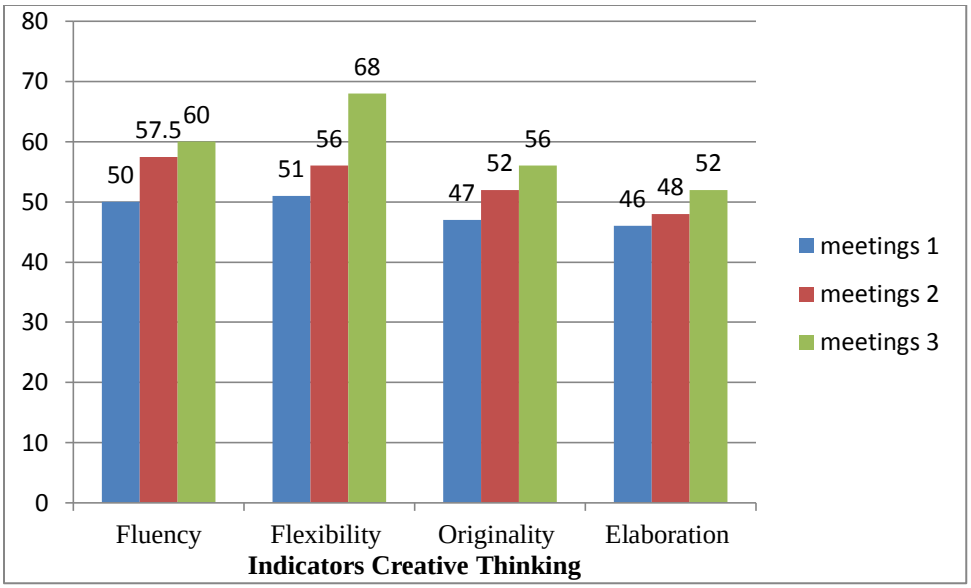
The results of a test of the effectiveness of the retrieved value average value of 1 at a meeting of the post-test (64.9), the mean value of the pre-wedding > test (27.4), meeting the average values of the test post 2 (75.2) the average value of the pre-wedding > test (36.1) and average value of 3 meetings, post-tests (76.5) the average value of the pre-wedding > test (34.1). Based on these results it can be concluded that there is an increase in the average value of each meeting means a meeting 3 average value is greater than 2 meetings and meetings 2 average value is greater than the meeting 1.

Increased creative thinking of the students also carried out assessments. The assessment is carried out to find out the increased ability of the creative thinking of each meeting. Increased creative thinking based on charge indicators will in each meeting can be seen in table 3.

Creative thinking skills indicators	Meetings 1			Meetings 2			Meetings 3		
	Pre tes	*Pos tes*	*N-Gain*	*Pre tes*	*Pos tes*	*N-Gain*	*Pre tes*	*Pos tes*	*N-Gain*
Fluency	23	50	0,4	33	57,5	0,4	30	60	0,5
Flexibility	28	51	0,4	32	56	0,4	31	68	0,6
Originality	25	47	0,3	17	52	0,5	25	56	0,5
Elaboration	25	46	0,3	21	48	0,4	24	52	0,4

Based on table 3, note that all indicators of creative thinking skills have increased on average at each meeting after using STM-based worksheet in learning. Creative thinking skills indicators respectively in the category of medium-gain values as written in table 3.

Based on the results of the assessment, it is known that the early creative thinking skills of students still in the category of creative and not creative enough, this shows that creative thinking skills students are still less trained. One factor causes still lack creative thinking of students is the students are still not accustomed to bringing up all kinds of ideas to answer any questions as well as students unfamiliar to do the steps in detail, but After treatment by using the worksheet which have developed creative thinking skills, experience increased entrance requirement i.e., the creative. After treatment by using the taught students worksheet as developed to obtain data through observation activities by using the steps in detail and systematic so that students are able to answer any questions varies, so all the indicators of creative thinking must-have students i.e., think smooth, flexible thinking, original thinking and elaborate experience increased.



Gambar1. Graph the value indicators of creative thinking Skills

Thinking smoothly have been met, judging from the students who have been able to do it yourself steps experiment with a few guidance teachers, flexible thinking indicators have been met, seen of the students have been able to interpret images presented to answer the question given, original thinking skills have also been met, judging from the students have been able to think of new things related to environmental pollution and think detailing (elaboration) quite fulfilled views from students who have been able to answer the questions of the steps that have been made at the time of learning in detail. Creative thinking in order to train students detailing the answers by doing things like detailed train students to make experiments, procedures detailing the goals and the tools and materials needed in the experiment, fill the table as well as make observations conclusions the observations which are the elaboration of indicators. The indicator thinks smoothly can be seen from the students ' ability to solve the problem of an article that presented (Wulandari, 2011).

Creative thinking skills can be fulfilled due to one of the activities is worksheet as presented in the learning-based STS began with delivers an article problem to be able to train the creative thinking skills of students. This is in line with research conducted by Nilson (2012) stating to think fluently in the need to motivate students and foster a sense of to learn continuously, Bettecourt et al, (2011) stating that the STS approach is capable of develop in students in learning can think flexible Baume (2013) holds the original thinking was able to explain a problem clearly criticised by way of considering exactly and what is, and Chantaranima and Yuenyong (2014) stated approach to STS was able to itemize some of the components that can be used to analyze a problem. Therefore it can be said that the STS learning can enhance creative thinking of students.

Conclusion:-

Worksheet based STS has effectively used in the learning process, as seen from the results of the average value of the post-test (64.9), (75.2) and (76.5) that has a value greater than the value of the pre-wedding tests (27.4) (36.1) and (34.1) and N-value of the Gain of each meeting experience improved IE 0.5 and 0.6. In addition, it is worksheet as developed to effectively train the creative thinking skills as seen from the improvement of creative thinking of every charge indicators will.

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