



TRACING OF SMP MATHEMATICS TEACHER'S SKILLS IN UTILIZATION OF TEACHING AIDS THROUGH SCIENTIFIC APPROACH

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ABSTRACT

Utilization of teaching aids in the mathematics learning of junior high schools (SMP) is still needed. Supposedly, the teaching aids are not only brought and demonstrated by the teacher in front of the class, but also students should be actively involved in the utilization of them. A learning to utilize teaching aids should also be done with scientific approach. This article was written based on the results of qualitative research to explore SMP mathematics teacher's skills in the use of teaching aids through a scientific approach. One indicator of the teachers have the skills mentioned above, can be observed and traced over the growing power of the teachers' creativity in designing, making, and utilizing teaching aids. The problems studied were as follows: (1) How is the tracing of the competence of SMP mathematics teachers in understanding the scientific approach in a learning? (2) How is the tracing of SMP mathematics teacher's skills in the use of teaching aids in the mathematics learning through scientific approach? (3) How is the tracing of the competence of SMP mathematics teacher in the designing, making, supplying, and utilizing teaching aids? Based on the three problems above, then the main goal of this research is to trace SMP mathematics teacher's skills in Semarang in utilization of teaching aids through scientific approach. To achieve the goal of this research, the research methods applied include three main activities, namely: (1) a tracing of SMP mathematics teacher's competence in understanding scientific approach in a learning, (2) a tracing of SMP mathematics teacher's skills in the use of teaching aids through scientific approach, and (3) a tracing of the competence of SMP mathematics teachers of mathematics in the designing, making, supplying, and utilizing teaching aids. Sampling data through questionnaires, observations, and open-ended interviews intensively. As a result: (1) the majority of SMP mathematics teachers in Semarang have been able to make a sense of scientific approach, (2) all SMP mathematics teachers have an opinion that teaching aids are still needed but some of them have a lot of confusion about how to use the teaching aids through scientific approach, (3) most teachers feel lack confidence in designing and making teaching aids. As a result of the addition, there are many teachers who want a training, a workshops, and a mentoring on how the mathematics learning model that utilizes teaching aids, which is implemented through a scientific approach.

Keywords: mathematics learning , teaching aids, scientific approach.

INTRODUCTION

Not all students, especially at the basic education level has a good talent in mathematics. However, the math should be given at all levels of education. So that students who are less gifted in mathematics have a good understanding of mathematics that he received, then the math teachers should improve their creativity in order to increase students' absorbency and also their creativity. One way that creativity of teachers, especially at the basic education level can be fostered is through the learning of mathematics assisted aid teaching aids eg packaged through Hand-on Activity.

However, not all teachers are able to think and find a way how to make use of teaching aids to be

operated through the activities that should be done by the students themselves such that the concept or the material which are taught by the teacher can be received and absorbed by the students. Therefore, if the teacher is able to think and find a way how to make use of teaching aids to be operated through the activities that should be done by the students themselves such that the concept or the material being taught can be received and absorbed by the students, then the teacher's creativity and the students' creativity will grow and develop. It is hoped that teaching aids are not only brought by the teachers, demonstrated by the teacher, the students nodded and took notes, and teachers assume that students already know. The risk

may indeed exist, such as the added cost, length of time, the need for additional equipment, or yet the emergence of the idea of the teacher. However, there is a will; there is a way.

Additional problems arise, whether math teacher can and skilled in designing and making teaching aids? Whether the teacher is also able to utilize teaching aids in mathematics learning through scientific approach? How to empower mathematics teachers so skilled in designing and making teaching aids through an effective training model? All these questions will be answered if it is carried out a qualitative research that will explore the skills of junior high school math teacher in Semarang in utilization of teaching aids through scientific approach.

Problems and Main Objectives

From the description above background, the problems will be solved through this research are as follows. (1) How is the tracing of the competence of SMP mathematics teachers in understanding the scientific approach in a learning? (2) How is the tracing of SMP mathematics teacher' skills in the use of teaching aids in the mathematics learning through scientific approach? (3) How is the tracing of the competence of SMP mathematics teacher in the designing, making, supplying, and utilizing teaching aids? Based on the three problems above, then the main goal of this research is to trace SMP mathematics teacher' skills in Semarang in utilization of teaching aids through scientific approach.

Targeted Innovation

The targeted innovation of this research are: (1) junior high school mathematics teachers skilled in designing, making, supplying, and utilizing innovative teaching aids in the learning of mathematics; (2) there will be an innovative learning model for mathematics learning that utilizes teaching aids through scientific approach; (3) there will be a training model that includes a training, workshops, and mentoring for junior high school mathematics teachers in the learning process that utilizes teaching aids through scientific approach.

Literature Review

The Necessity of Utilization of Teaching Aids in Learning

The students at the basic education level, SD/MI or SMP/MTs, in general are still at the stage of concrete thinking. If there are students at the basic education level who have been able to become a champion in the national mathematics competition or even in the international mathematics competition, it is only a small or very small portion of all students in basic education. "Special" children who have very special intelligence are not discussed in this description. The children who are studied were regular, normal kids, or children with normal intelligence. For these students, it seems they need teaching aids to accelerate their absorption rate in accepting the subject matter. In a learning, Brazdeikis dan Masaitis (2012) dan Suharjana (2009) wrote that the learning media is

defined as all objects that mediate in the learning. Based on the function of media, it can be teaching aids and means.

Therefore, teaching aids in the learning of mathematics is a part of the learning media. Government Regulation No. 19 of 2005 Section 42 (1) stated that "Each educational unit must have the means, which include furniture, educational equipment, educational media, books and other sources, consumable materials, and other supplies needed to support the learning process regularly and sustainable ". It is clear that that the teaching aids, which is one form of media education, is a part of the means which must be owned by each unit of education, especially at the basic education level. Suyitno (2007) wrote that media are different types of components in the environment that can be used by teachers to motivate students to learn. While the position of the teaching aids associated with components of teaching methods and is one of the efforts to enhance the process of teacher interaction with students in the learning environment. Learning activities using teaching aids is very significance to the success of student learning. It is hoped that by using teaching aids then students can see, touch, and express the direct object of thinking that they are studying. Thus, the abstract concept being studied can be precipitated, attached, and long-lasting in the minds of students' minds. The use of teaching aids can be attributed to aspects of the forming concept, understanding concepts and coaching skills, and also increasing of student motivation. In a teacher book of Curriculum 2013, it was written explicitly that teachers are suggested to pay attention to the following: "Use media or alternative learning resources available in the school environment, such means can be a person, material, or events".

Functions and Roles of Teaching Aids

In general, the function and role of teaching aids are, :(1) to overcome the differences in students' personal experience; (2) to overcome the limitations of space, time, and power senses; (3) to make concrete from the abstract concepts; (4) to clarify the presentation of the message, so as not to overly verbal; (5) complements and enriches the information in learning activities; (6) laid the foundations that are important for the development of the study such that it can make the lesson is more steady; (7) gives a real experience that can grow on their own activities among students; (8) replacing the dangerous objects or objects that are difficult to be obtained in the learning environment; (9) allows students to interact directly with the environment; (10) allows uniformity observations and perceptions of students' learning experience; (11) generate interest/motivation to learn; (12) gives the impression of individual attention to all members of the group; (13) controls the direction and pace of student learning; (14) to increase the effectiveness and efficiency in the delivery of messages (lessons); (15) to add variety in the presentation and or delivery of messages (lessons); (16) to give similarities/unity in the observation of something that

is in the early observations may be they had different meanings.



Figure 1
One of the teaching aid of mathematics which can be provided by the teacher/school.

In the selection of teaching aids, there are requirements that must be satisfied by a teaching aid such that it can be used according to the needs of the learning. Teaching aids that are used by a teacher should be a tool which can make students easier to understand a theory or find a proof formula, so that students can do their task in the learning. Some of these requirements include the following. (1) Teaching aid should be made of strong materials so that it is durable and long lasting. (2) Shape and color of teaching aid should be attractive. (3) Teaching aid should be simple, easy to carry, and easy to use. (4) The size of teaching aid should be fit so that easily seen by all students. (5) Teaching aid can be used to present mathematical concepts in the form of real, drawings, or diagrams. (6) Teaching aid is in accordance with the mathematical concepts that are being taught. (7) Teaching aid can clarify the concepts of mathematics and not vice versa. (8) The use of teaching aid is expected to be the basis for the growth of the abstract thinking for students. (9) Teaching aid can make the students to learn actively and independently by manipulating them. (10) If possible, it can be useful teaching aid for more than one purpose.

The criteria of using teaching aids is based on the following points. (1) Purpose. Selection of appropriate teaching aids can affect the learning objectives that should be achieved if the teaching aids are able to increase domain, cognitive, and psychomotor which are the purposes of a lesson. (2) Subject Matter. Teaching aids are usually used to help students understanding of a basic concept in mathematics learning materials to facilitate students in understanding of the material within the scope and higher difficulty. Demonstration of teaching aids for basic concepts is used to facilitate in understanding of the next concept. (3) Learning strategies. The using teaching aids will facilitate teachers in implementing teaching strategies. The using of teaching aids is a learning strategy in the method of the invention or the methods of demonstration. (4) Conditions. Teaching aids help teachers in certain conditions eg only on condition that a classroom is full of students that is needed loudspeakers to facilitate teachers to be heard by the students when he is explaining the material. (5)

Students. Selection of teaching aids is tailored to what is liked by students for example in the form of game teaching aids, but it is certainly not independent of learning goals.

Utilization of Teaching Aids Through Scientific Approach

In Permendikbud No. 081A In 2013, a scientific approach in learning includes the stages of observation, ask, gather information, associates, and communicate. One model of learning by making use of teaching aids that can be presented by scientific approach is Hand-on Activity. Hand-on activity (HoA), is a learning activity that engages students to engage in activities that involve almost all the senses, physical activity, and supporting tools. The students involved in the activities of think, observe, ask, gather all the information, measure, reasoning, drawing, cutting, folding, or paste the results of his work, and finally students are expected to communicate the idea to his friends. In the hands-on learning activities, it is sometimes needed facilities and a small additional cost to support it, for example, the need for the availability of hvs paper, manila paper, a ruler, scissors, glue, etc.

Through hands-on activity, students can be trained by the teacher to find the nets of a cube by themselves through the learning activities. Teacher gives just one example of the nets of a cube, students are asked to observe carefully, then they asked, discussed in their group to gather all information in the search for different nets of a cube, the students tried to associate/reasoning, to find, and if they have found it, the students are asked to communicate it in front of the class.

Teacher Creativity Power in Creating Innovative Teaching Aids

Creativity of mathematics teachers in designing and making of innovative teaching aids is very needed. Teaching aids that are designed and made by teachers, are expected to be match with the material which is presented.

Creativity or creative thinking ability, is the act of thinking that generates creative ideas or new ways of thinking (innovative), original, independent, and imaginative. Teacher creativity can be seen as a mental process. This creative power refers to the ability to think more one step forward and is a product of ideas than to most others.

It is related to the above article, then according to Naiman (2006), "Creativity is the act of turning new and imaginative ideas into reality. Creativity involves two processes: thinking, and then producing. Innovation is the production or implementation of an idea. If you have ideas, but do not act on them, you are imaginative but not creative." Thus, Naiman illustrates that creativity as an act of turning imaginative ideas and a new character into reality. Creativity involves two processes, those are to think and then to produce. Innovation is the result or the implementation of an idea. If someone has ideas but he doesn't pass these processes then he was called an imaginative people but not a creative people.

Hassan (1997) wrote that the words "kreativitas" comes from the words of the West "creativity" which means efforts to create or creativity power. The words of creativity also comes from the Latin word "creare" which means "to make". According to Young (1999), creativity also comes from the word "Greekrainein" which means "to fulfill". However, according to Torrance (1988) it is very difficult or impossible to provide a definition that is really appropriate. It is caused by the characteristics of creativity itself is also infinitive and involve all the senses possessed by humans, including the senses of sight, hearing, smell, taste, and feeling. Torrance (1988) also added that it is very difficult to express the definition of creativity in the form of words. Beside that, Isaksen (1987) also confirmed that it is very difficult to give a precise definition of creativity which is concerned with the nature of creativity itself.

Isaksen (1987) also added that not only one of science disciplines which are entitled to assess the power of creativity. Morgan & Forster (1999) explained that in the field of education, in their efforts to know creative students, the educators need to understand the meaning of creativity. According to Goh (1993), understanding of the concept of creativity is very important for teachers because through this understanding, there will be an available pattern to guide teachers in designing and implementing of typical exercise program to improve students' creativity.

According to Cropley (2001), overall the experts in the field of creativity agree that creativity has three main elements, namely: (1) Authenticity (a product, an action or creative ideas should aberrant). (2) Achievement (achieve desired goals). (3) Ethical (creative term is not usually used to describe acts like an arrogant selfish, destructive behavior, etc.). In conclusion, the understanding in the concept of actual creativity is very important especially for teachers who nurture students' creativity in the class.

Teachers in primary education, especially junior high school teachers need to make changes in the learning process by making breakthroughs or choose an innovative model of learning. Of course, the application of a new innovative model of learning must be carried out with dedication and responsibility as educators, especially as a mathematics teacher in primary education.

In order to foster creativity of mathematics teacher in primary education, the teacher needs to: (1) always think, to follow up the results of his thinking, and execute the idea in finding ways to make learning material can be understood by the students well; (2) try to find new ways/innovative ways such that in the use of teaching aids can be packaged/presented by Hand-on Activity; (3) always strive to develop the idea that the teaching aids are not only to be brought to the front of the class, were shown to students, demonstrated to students or ask one student to try, the students just sit back, and finally the students only recorded if it is required or it is ordered by the teacher,

In addition to the above, in order to grow and to flourish the creativity of students, then the attitude of

the teacher should: (1) willing to listen to opinions, questions, or even complain of students; (2) willing to respect the opinion of the students, even if it is incorrect; (3) foster and develop self-confidence of students; (4) ready and willing to provide a challenge to the students; (5) encourage students to dare in expressing ideas; (6) make a condition for student such that they are not afraid to make mistakes. It is needed by the students, because if the students in basic education are afraid to make mistakes, then they would not dare to try new things, which means that students creativity doesn't develop..

If the creativity of teachers and students is not growing, then it implies that there will be no new invention (no effectiveness in learning). Related to the above, if a teacher in primary education will foster creativity of students in mathematics, it is necessary to look for the kind of learning that is able to (1) enable student learning, (2) encourage students to dare to reveal the idea/invention by themselves, (3) encourage students to think in any other way or think of alternatives, (4) make students feel happy in the learning of mathematics, and (5) enhance cooperation among the students in ways that polite in behavior.

Research Purposes

The main objectives as described above can be broken down into more specific goals namely: (1) Tracing the junior high school mathematics teacher competence in defining scientific approach in learning. (2) Tracing the junior high school mathematics teacher's skill in using teaching aids in mathematics learning through a scientific approach. (3) Tracing the junior high school mathematics teacher competence in designing, creating, providing, and using teaching aids.

Benefits of Research

This research is considered very beneficial, namely: (1) to see whether the junior high school mathematics teacher know in defining scientific approach to learning. (2) to see whether the junior high school mathematics teachers have skill in the use of teaching aids in mathematics learning through a scientific approach. (3) to empower the junior high school mathematics teachers competence in the designing, making, providing, and utilizing of mathematics teaching aids.

METHODS

As research subjects, it is taken junior high school mathematics teachers in Semarang. To achieve the objectives of this research, the research methods applied include three main activities, namely: (1) a tracing of the junior high school mathematics teachers competence to interpret the scientific approach to learning, (2) a tracing of the junior high school mathematics teachers' skills in the use of teaching aids through a scientific approach, and (3) a tracing of the junior high school mathematics teachers competence in designing, making, providing, and utilizing of mathematics teaching aids. Capturing data is taken

through questionnaire, observation and open interviews intensively.

Indicators of Achievement

Indicators of achievement of this research are as follows. (1) It is identified in the junior high school mathematics teacher competence to interpret the scientific approach to learning in Semarang. (2) It is identified in the junior high school mathematics teacher's skill in using teaching aids in mathematics learning through a scientific approach. (3) It is identified the junior high school mathematics teachers competence in designing, making, providing, and utilizing of teaching aids.

RESULTS

Based on the results sheet stuffing Questionnaire forwarded by classroom observation, and interviews, then it was obtained the following results. (1) The competence of junior high school mathematics teachers in defining scientific approach to learning in Semarang has been identified well. It was shown that the junior high school mathematics teachers have been able to interpret the scientific approach to learning. They know that the stages of scientific approach by students is to observe, to ask, to gather information, to associate, and to communicate. (2) Skills of the junior high school mathematics teachers in the use of teaching aids in the learning of mathematics has been identified well. It was shown that the junior high school mathematics teachers have an opinion that teaching aids are still needed in the learning such that the concept of mathematics can be quickly absorbed by the students. However, some teachers had confusion about how to teach mathematics assisted teaching aids which is packaged in the form of scientific approach. (3) The competence of junior high school mathematics teachers in designing, making, providing, and utilizing of teaching aids have been identified well. It was shown that the junior high school mathematics teachers need to provide and utilize teaching aids in explaining of mathematics material. However, teachers feel less good in making of teaching aids, especially female teachers. In addition, most teachers feel less confident in designing of mathematics teaching aids.



Figure 2. The Research Team interviewed teacher/respondent



Figure 3. The Research Team observed teacher in learning

CONCLUSIONS AND SUGGESTIONS

Conclusion

The conclusion of this research are as follows. (1) the junior high school mathematics teachers in Semarang have been able to interpret the scientific approach to learning. They know the stages of the scientific approach which should be done by the students. (2) the junior high school mathematics teachers have an opinion that teaching aids are still needed in the learning such that the concept of mathematics can be quickly absorbed by the students. However, some teachers had confusion about how to teach mathematics assisted teaching aids which is packaged in the form of scientific approach. (3) Teachers feel less good in making teaching aids, especially female teachers. In addition, most teachers feel less confident in designing teaching aids.

Suggestion

The suggestion of this research are as follows. (1) It's better if the junior high school mathematics teachers use teaching aids in the learning in order to make the concept of mathematics can be quickly absorbed by the students. (2) The junior high school mathematics teacher in Semarang need to be trained and assisted in the designing, making, providing, and utilizing of mathematics teaching aids in a learning through a scientific approach. (3) In addition, the universities, in particular for Semarang State University, can carry out a training and a mentoring for teachers on learning by utilizing teaching aids especially for junior high school mathematics teacher in stages, integrated, and in accordance with the needs of teachers to increase their competence in the service of learning.

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