EXPLORATION OF STUDENTS' MATHEMATICAL POWER IN INDONESIA THROUGH THE INNOVATIVE MATHEMATICS LEARNING

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ABSTRACT

This research is a descriptive study conducted on 82 public primary school students in the Bandung city who implemented the innovative mathematics learning to explore students' mathematical power. This research is packaged in lesson study activities through the stages of plan, do and see are carried out by the author, teacher and several graduate students. The data was obtained from observations of learning, interviews with teachers and students and the observations of the activities of students and teachers. The results showed that (1) The innovative mathematics learning undertaken by teachers will to be more effective and innovative if there are any regular assistance from the education department in collaboration with universities in the field of education are packaged in lesson study activities; (2) The students' mathematical power will be explored optimally when the classroom is set up in cooperative learning, and teachers used to strengthen the students' initial ability (3) The response of the students and the teachers on the innovative mathematics learning was positive in generally; (4) The teacher's activities for managing the innovative learning more dominant in guiding the activities of students in group work and discussions.

Keywords: Mathematics, Innovative, Mathematical Power, Exploration

A. Introduction

In the era of globalization is required intelligent human beings who adaptive to technological developments to be able to survive in the situation that is always changing, uncertain and competitive. Jalal and Supriyadi (2001: 18) says that education should be able to play a role in preparing the nation in the constellation of global society. This condition requires a paradigm shift in education including learning orientation which was originally teacher-centered switch on student-centered, a method which was originally dominated expository changed to participatory, more original approach to textual turned into contextual.

Mathematics is a science that is obtained from the human thought process in the world of ratio, processed analysis and synthesis with the reasoning in kognitif structure. Through the learning of mathematics, the mathematical power of the students which include mathematical understanding, mathematical communication, mathematical connection, mathematical problem solving and mathematical reasoning can be developed, so well that according Hassoubah (2004: 13), through this learning students can develop themselves in making decisions, judgments, and solve the problem.

Mathematics learning paradigm in Indonesia today often only produce students who are instrumental understanding, more attention to the outcome of the process. As a result, the students do not understand or appreciate the mathematical concepts and difficult to apply mathematics in everyday life. It required an innovative mathematical learning that can explore students' mathematical power optimally. Innovative learning is meant by Burhanuddin (2014) is a packaged learning by learners at the instigation of new ideas which

are the product of learning how to learn to perform the steps of learning, so as to make progress learning outcomes.

B. Theoritical Framework

Various countries have conducted various research projects to develop these mathematical power. In Singapore, Lim and Pang (2002) developed a project that seeks to develop critical thinking skills and a deep understanding of mathematics to improve student learning outcomes in mathematics junior high school in Singapore. This project piloted a teaching material using historical sources in it. The results show that the development of mathematical ideas historically can give meaning to the mathematical exercises current and historical material can encourage attitudes of teachers and students' inquiry. In China, Shihu and Jijian (2001) conducted a study of junior high school students in Lanzhou using exploration teaching. The results show that divergent thinking ability of students in the experimental class is higher than the control class, and in terms of variability and authenticity aspects aspects that differ significantly, as well as the awareness of innovation's experimental class is higher than the control class. In the United States, Mann (2005) conducted a study of 89 junior high school students grade 7 in suburban Connecticut to see the link between the creativity of students in mathematics with students 'skills in math, student attitudes, perceptions of students' creativity in math, the teacher's perception of the ability and creative talents of students, as well as gender. The results showed: (1) There is a positive correlation between the ability of students in mathematics with his creativity in mathematics; (2) Perception and the talent of the teachers in general are not positively correlated with students' creativity in mathematics; (3) Perceptions and attitudes of the students are positively correlated with their creativity in mathematics; (4) Gender are positively correlated with creativity of students in mathematics but the average scores of female students in mathematical creativity is higher than male students.

In Indonesia has also developed a variety of innovative mathematics learning are developed in the form of a project funded an institute or private. According to Burhanuddin (2014), an innovative learning is a learning where: 1) Students are involved in various activities that develop their understanding and their skills with an emphasis on learning by doing; 2) Teachers use a variety of tools and various ways of stimulating, including using the environment as a learning resource to make learning is interesting, fun, and suitable for students; 3) The teacher set up the classroom by displaying books and learning materials more attractive and provide a 'reading corner'; 4) Teachers apply a way of teaching that is more cooperative and interactive, including apply cooperative learning; 5) The teacher encourages students to find their own way of solving a problem, to express their ideas, and engage students in creating a school environment.

The innovative mathematics learning is based on the opinions of Piaget (Stiff et al, 1993) which states that the human mind contains schemata which is used by somebody for adapting and coordinating with the environment to form new schemata through assimilation and accommodation. Schemata which formed through a process of assimilation and accommodation is called knowledge. Assimilation is the cognitive process in which a person integrates information (perceptions, concepts, and so on) or a new experience into cognitive structures that are already owned by someone. Accommodation is the process of restructuring the existing schemata as a result of a processing of information and knowledge from their new experiences that can not be directly assimilated into the schemata. In other words, can be explained that when a new information is introduced to someone and it fits into the schemata information he already has that information is adapted through the process of assimilation and forming new knowledge. Whereas if new information was introduced it does not match the existing schemata then it will occur disequilibrium. For that to happen, the equilibrium

existing schemata back restructured in order to adapt to the new information so that new information can be accommodated and then assimilated into the new knowledge.

C. Research Methods

This research is a descriptive study that aims to describe the implementation of innovative math learning to explore students' mathematical power. The study subjects consisted of 82 public primary school students in Bandung city. Data in this study were obtained through the learning observation, interview with the teachers and students, observation of the activities of the students and the teachers, as well as lesson study activity among writers, teachers and some postgraduate students of mathematics education.

D. Results and Discussion

1. Lesson StudyResults Activity

The author with some postgraduate students of mathematics education and the teacher designed the material learning to be taught. After the planning considered adequate, the teachers implement instructional. The author and postgraduate students perform learning observation. For the more happen communication which is multidirectional, teachers set up working groups and discussions. Then, to motivate students in order to want to learn math, teacher began the learning by inviting them to sing along to impress them that learning mathematics is fun and not difficult, as shown in the following figure:

Figure1. Teachersinvitestudentsto sing

After I teachergivesa briefexplanation I materialand thengivepropstoeach groupby linkingthecontextualissuesclose to theeveryday lifeof students.

Figure 2.Distribution ofprops

Once the props are given, the teacher gives examples of how to use props associated with a given contextual problem. Within each group of students are encouraged to discuss and exchange ideas. Activity is expected to do the student to solve the problems in its own way students and try to guess about the solution of various problems, as shown in the following figure:

Figure 3. Group Discussion

Teachersaround theobservedactivity of students indiscussionand group work, then askonerepresentative fromeachgroupin turnforward to presentthe answerin front I class. After that, theteacher discussone by onethe work I group.Andworkwith thegroupapproachedthe expectedanswersserve as an exampletobe discussed in moredepth, as shownin the following figure:

Figure 4.Representatives I groupwrote downthe results I discussionon the board

Teachers providesimilar issuesbut no longerwith theuse ofpropsbutjust askthe studentsto discussin groups anddescribe thesolutionsto these problemsatHVS, asfollows:

Figure 5.Drawingin the groups

The results of further discussions in the form of pictures pasted on the board. Teachers expound the taped images. The teacher asked the students, the topic of what has been and is being studied and ask students to express a conclusion on what has been learned. The teacher gives review of the conclusions that have been expressed by students as well straighten or fix it. At the end of the lesson, the teacher distributing student's activity sheets to each student to work with the group. Activity sheet is equipped with tables to guide students in the finish. As a closing lesson the teacher gives a quiz question to the whole group, a group that can answer correctly to rest first and take snacks that are already prepared in front of the class, before leaving the classroom.

Figure 6. The teacher gives Quiz

After the study is done, the teacher along with author and postgraduate student evaluation of learning that occurs and perform remediation efforts for the next lesson . Learning is focused in accordance with the principles of John Dewey (Tim MKPBM, 2001: 48) as the leader of Gestalt theory, which suggests that the implementation of teaching and learning are organized teachers should pay attention to the following points: (1) Presentation of the concept should prioritize understanding; (2) Implementation of the learning activities must consider the intellectual readiness of learners; (3) Set up the atmosphere of the class so that students are ready to learn. In addition the sequence of learning activities undertaken adjusted to the reconstruction process of the student according Hudoyo (2003: 1) the order is as follows: (1) Students present objective knowledge by means of constructing a circular indicated by grooves examine / investigate, explain, expand, evaluate resulting in the reconstruction of the initial conception, the initial conception of the student as a result of reconstruction is subjective knowledge; (2) The Subjective Knowledge kemudsian collaborated with other students, teachers, the learning that occurs as a result of reconstruction scaffoldin process. (3) Knowledge reconstructed as a result of the scaffolding is then represented by the group so that the new knowledge that students' conceptions after learning that it becomes objective knowledge possessed.

E. The student and teacher responses to the Learning Implemented

To determine the response of students to the learning of mathematics which have implemented, we use a questionnaire consisting of 18 questions with a choice of yes or no answer. From the results of the questionnaire processing is seen that 86% of students responded positively to the learning of mathematics which have implemented. To determine the response of teachers to the implementation of learning, the authors propose a number of written questions to the teachers who implement the learning process. The teacher's response in generally that teachers do not experience significant barriers in implementing the planned learning.

F. Activity Students and Teachers in Learning

During the study, the percentage of student activity is included in the active category. While the most dominant activity is working in a group. If compared to the activity of the students at the next course is better than the previous learning. Teacher used to determine the activity of the teacher activity observation sheet and a number of written questions as an effort to confirm the results of observation. The result can be concluded that 90% of teachers felt their doing activities are in accordance with the plan of the learning . While based on the author's observation, it appears that most of the teacher's activities undertaken was guiding the activities of the students. The quality of the teacher in the learning activities on the next observation better than the activity of teachers at the previous observation.

G. Other Findings

During the study, many findings are obtained by the author, The findings are:

a. At first, teachers do not start learning by presenting contextual issues, there is no theme, no pemformalan and the teachers less encourage students to make modeling. But at the next meeting after a discussion with the author and postgraduate students, the flaws were patched.
b. The order of questions in the student activity sheet initially less encourage the students' activity, but it corrected in the next meetings in accordance with the results of discussions between the teachers and the author.
c. Initially modeling by students are not yet apparent, but after teaching materials are revised, modeling already apparent.
d. Initially formalisation by the teachers are still not optimal, too jumped to the concepts to be taught. But after the teaching materials are revised, formalisation more runs sistematically.
e. The number of students in one group was initially too much (one group consisted of 7-8 students) as well as setting the table – the chair is less supportive of participation and interaction between students in discussion or group work, these flaws is rectified at the next meeting with a number of students in groups of 4-5 persons with a circular seating positions.
f. Problem which is used in the Student Activity Sheet initially still not yet fully reflect the concepts being studied, but later corrected by first identifying the essential concepts of each material.
g. Initially a lot of time wasted, because when tasks have been successfully completed by a group, while the other group is not yet completed, then the first group member will play around class or perform behaviors that are not relevant to learning. The solution is the ability of students in a group made more balanced with a matter that further explore their ability's communicating and thinking.

H. Conclusion

Based on the result as has been presented, the conclusion can be stated as follows.

1. The innovative mathematics learning undertaken by teachers will to be more effective and innovative if there are any regular assistance from the education department in collaboration with universities in the field of education are packaged in lesson study activities.
2. The students' mathematical power will be explored optimally when the classroom is set up in cooperative learning, and teachers used to strengthen the students' initial ability.
3. The response of the students and the teachers on the innovative mathematics learning was positive in generally.
4. The teacher's activities for managing the innovative learning more dominant in guiding the activities of students in group work and discussions

I. Suggestions

Based on the conclusion, we can put forward some suggestions as follows:

1. The education department should be in collaboration with the instructur of college education in doing mentoring on the field more intensively and evenly at all grade levels, and doing communication with officers in the field regularly and periodically, so the difficulty officers in the field can be immediately addressed.

2. Socialization the innovative learning for all officers in the field are improved so that innovative learning that run completely in accordance with the characteristics and principles of the innovative learning which will be done.
3. The text books of the students should be packed in accordance with the characteristics and innovative learning principles so it can be used effectively in the field.
4. In determining the many members of the group of teachers should pay attention to the effectiveness of group work, to avoid the number of members of the group were too big, because it opens up opportunities for students who are not involved in group work activities to do something not relevant.

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