INFLUENCE OF COOPERATIVE LEARNING MODELS OF STAD WITH APPROACH REALISTIC MATHEMATICS EDUCATION (RME), PAIRS CHECK, AND INQUIRY AGAINTS UNDERSTANDING OF CONCEPT AND PROBLEM SOLVING OF MATHEMATICS

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Abstract

Lack of proper understanding of concepts in mathematics can be seen from the way resolve the problem. It is necessary an effort to improve the quality of learning, one of them by making students active learning combined with a variety of approaches, such as RME, Pairs Check, and inquiry. The third of approach implemented in different classes to know influence of three to understanding concepts and solving math problems students.

This study is an experimental research is to determine the effect of understanding of mathematical concepts and problem solving using learning STAD cooperative learning model to approach Realistic Mathematics Education (RME), Pairs Check, and inquiry.

The results of the data analysis we concluded there are significant conceptual understanding and problem solving among students of four semesters in mathematics education department of UIN Suska Riau which uses learning STAD cooperative learning model to approach Realistic Mathematics Education (RME), Pair Check, and inquiry. From data analysis was concluded that the best approach of the three approaches above is the RME approach.

Keywords:Realistic Mathematics Education (RME), Pairs Check, Inquiry

INTRODUCTION

Data PISA (Programme for International Student Assessment) in 2012 explained that the mathematical ability of Indonesian students were below the standard they set (Stacey : 2013). The results of the data presented by the PISA indicates the student's mathematical knowledge have not aligned with the developed countries . This is contradictory to the results of a national exam in Indonesia, which puts it at about above 90 % of students graduate with good grades or very satisfactory for mathematics courses (Kemendikbud : 2014). Standard national exam for the year 2013 was 7.5 and the average student is able to achieve the standards even exceed them. Results of student scores from year to year also increased. However, national exam results obtained turned out to not meet international standards, meaning that Indonesian students mathematical knowledge has not been able to be aligned with international standards.

Two of the above information, it is very contradictory. On the one hand, the government stated that the average mathematical ability of students achieve the standards, but in the international world (according to PISA) average mathematical ability of Indonesian

students were below the standard of other countries. Another thing that experience gap,which the student is able to work on the problems that exist in the national exams properly, but in the daily learning, they tend to be mediocre. It is caused by intense exercise undertaken by the school to train the students do the problems correctly within a certain time interval, so it is not surprising national test results satisfactory average.

In addition, the mathematical ability of students nationwide test version did not have an impact on the mathematical concept of high ability students. Such an event occurred in the Department of Mathematics Education of UIN Suska Riau. Although math scores held the students in national examinations tend to be high, but in fact their knowledge of mathematics is still minimal. The study begins by give a short test about linear program to the student's four semester academic year 2013/2014, after having analyzed the data obtained:

A. Problem solving

Step Completion	Correct answer				
	Class 4A (30 students)	Class 4B (30 students)	Class 4C (30 students)	Class 4D (30 students)	Class4E (30 Students)
Understanding the problem	13	10	10	14	16
Make a plan solving	13	11	9	13	9
Implement a plan problem solving	13	11	9	13	9
Crosscheck	Not conducted by students				

B. Understanding of the concept

Indicator	Correct answer				
	Class 4A (30 students)	Class 4B (30 students)	Class 4C (30 students)	Class 4D (30 students)	Class4E (30 Students)
Re-interpret the concept owned	12	10	10	14	16
Classify objects according to certain properties	13	10	9	13	9
Formulating the problem	13	11	9	13	9
Perform calculations	13	10	10	14	16

Based on the table above, more than 50% of students from each class, have problem solving kills and understanding of concepts that are less good. Most of them, an understanding of the basic concepts of mathematics is still weak, so the ability to solve the problem tends to be low. Problems that occur must be overcome with appropriate learning innovation, and learning should be student-centered, not teacher-centered.

One model of learning that is student-centered cooperative learning. Where on cooperative learning, student activities more focused on learning in groups to help each other, argue with each other and discuss, to hone the knowledge that they control and

close the gap of understanding each (Slavin: 2010). Similarly, according to Jolliffe (2007), cooperative learning requires students to work together in small groups to support each other to improve their own learning and understanding of the others. Thus, cooperative learning to actively engage students in learning so that the learning experiences gained from making knowledge students become better.

One is a cooperative learning STAD (Student Team Achievement Division). In STAD, students are divided into small groups with heterogeneous capabilities, the success of the group becomes the main thing, indirectly brilliant student partially responsible for helping weak students in each group so that students can develop the skills and proficient skills they have and otherwise weak students will be helped in understanding the subject matter covered.

STAD making students active in their activities, and learning centered on student activity, there are also the RME approach, pairs check, inquiry. In the third approach, student-centered learning activities in to construct their knowledge. The following will explain the approach to learning with all three.

1. Learning realistic mathematics or RME is also called the learning of mathematics should be linked to the environment and the daily activities of students (contextual). According to Treffers and Goffre, contextual issues (RME) are presented in the learning of mathematics is able to form a clear concept on students so as to encourage him to think to solve the contextual problems that typically occur in their everyday lives.

2. Learning inquiry by Gulo are a learning activity involving maximally throughout the student's ability to locate and investigate things (objects, people or events) in a systematic, critical, logical, analytical so that they can formulate their own inventions with aplomb (Trianto, 2011). Taken in inquiry learning students, knowledge or understanding shaped by their activities so that they can formulate their own findings and can be used in solving the problem. If students are able to become a problem solver, the concept that is in very good students because they are able to associate the concept and other concepts through the process of search and investigation.

3. Learning with check pairs (Arends: 2009) is a student-centered learning in which students work in pairs and applying makeup checking their partners work. The advantages of this study can help students turn their knowledge schemata so that learning becomes meaningful to encourage a way of thinking and imagination more developed , cultivate an attitude of mutual cooperation and to improve communication skills and motivation to study (Isjoni, 2010) .

The third approach above has a different characteristic, so the researchers are interested in applying this learning in the classroom and combined with STAD model to determine the effect of learning the concepts and understanding of students learning abilities. Based on the background, formulation the problem is How to influence cooperative learning model approach stad with realistic mathematics education (RME), pairs check and inquiry to understanding math concepts and problem solving of at four semester students majoring in mathematics education of UIN Suska Riau?

THEORETICAL FRAMEWORK
Realistic Mathematics Education
In view of Realistic Mathematics Education (RME), mathematics learning should be linked to the real world and close to the student experience. According to de Lange (Fauzan : 2009), RME is potential to applied because the process of developing concepts and mathematical ideas originated from the real world will be reflected in the results obtained in mathematics back to reality. In other words, what we do in mathematics learning is taking something from the real world (contextual problems), then " mathematization ", then bring it back to the real world. Mathematization process there are two, namely horizontal mathematizationand verticalmathematization. Horizontal mathematization left from the real to the symbolic realm, while the vertical mathematization symbol comes from the world of a general nature to be reflected into the realm of the real . According to Freudenthal, mathematization form is actually no different from the meaning and value is the same. According to Treffers and Goffree, contextual problems filling function useful for :

1. Formation of the concept . At the beginning of learning, student directed into mathematics naturally
2. Establishment of a model. Students are given a contextual problem, they will enter the foundation to learn the operatio, procedures, notation, rules , it is becoming important to learn for the students because this is where their thought processes in learning
3. Application. Contextual real problem serves as a source of knowledge to be used as applied in the daily life of students.
4. Practice and training . Using knowledge can be in learning to solve contextual problems everyday .

Seen that RME is near the daily lives of students, so that they can solve contextual problems both horizontally and vertically to construct concepts in students to know real mathematics and not just abstractions.In realistic mathematics learning, there are several principles that must be met. Gravemeijer (1994), suggests three main principles, namely:

a. Guided reinvention and progressive mathematizing
   In studying mathematics, students are given the opportunity to have the experience as a process in which mathematics is found , namely through mathematization both horizontally and vertically. Mathematization in this case meant creating a completion procedure which gives an opportunity to the inquiry process .Mathematics is seen as an activity and ways of working. Learning mathematics means working with math (doing mathematics), which is solving problems in daily life is an essential part .

b. Didactical phenomenology
   According to the phenomenology of education, the topics that are taught must be associated with everyday phenomena and realistic (to be imagined by the students). Therefore, in studying mathematics, students need to start from the problems (phenomena) are contextual issues in everyday life.

c. The self - developed models
   In studying mathematics students should develop their own models. Students develop a model to solve the problem at the moment. At first the students use the

model for solving the informal, after the interaction and discussion in class, one student proposed solution will evolve into a formal model. At first a model of a model taken from a special problem situation, then the model is generalized to the situation. Furthermore, the model changed in character that is the reality. In this new form of the model can serve as a basic model for the mathematical thinking at the formal level. Thus students initially construct their own models and these models are stored as a basis for developing a formal mathematical knowledge.

Pairs Check

Pairs Check learning that helps students who like to dominate learning to share knowledge to other students by way of each other in pairs and performing checks on the work of the partner. The learning steps recommended by Spencer Kagan, namely:
1. Working in pairs, students are grouped in pairs to work on an activity sheet. One student work and other student aid or train
2. Coach check, the student who became a coach checks the work of his partner. If the coach and his partner do not agree, they should seek advice from other couple
3. The coach praised, praised the work of his partner if the answer was correct
4. Exchanging roles, all partners swap roles and repeat steps 1 through 3
5. The pair checked, the whole team back and compare answers
6. The team expressed joy together, when all the answers had been approved by the entire team, then they can show the sense of joy

Inquiry

Inquiry comes from the word meaning to inquire participate, or engage, in asking questions, seeking information, and conduct investigations (Herdian, 2010). In learning, inquiry approach according Hamalik (2009) is a student-centered learning (student-centered -strategy) in which groups of students completed a question or search for answers to the questions in a procedure and structure are clearly outlined. According Gulo (Trianto: 2011), inquiry learning is a learning activity that involves optimally throughout the students ability to locate and investigate things (objects, people or events) in a systematic, critical, logical, analytical so that they can formulate their own findings with confidence. Based on the above definitions it can be concluded that the inquiry is a process taken by students in the search for knowledge or understanding so that they can formulate their own inventions that could be used in solving the problem. The steps of inquiry by & Kaucak (Trianto: 2011), namely :
1. Presenting a question or a problem, give the student worksheet and divide the students into discussion groups
2. Creating hypotheses, provide opportunities for students to express opinions in making hypotheses and teachers guide students in determining hypotheses relevant to the issues and prioritize which ones take precedence hypothesis
3. Designing the experiment, giving an opportunity to the students to determine the appropriate steps to be performed and the hypothesis that sort of guiding students through the experiment
4. Conduct an experiment to obtain information, guiding students through the investigation information
5. Collecting and analyzing data, providing the opportunity for each group to present the results of processing the data collected
6. Creating conclusion, guiding students in making inferences

Understanding the Concept

Understanding the concept is one of the important goals of learning, giving the sense that the material taught to students not only as a rote, but more so with the understanding that students can better understand the concept of the subject matter itself. According to Anderson (2001), the student is said to understand something if they are able to construct meaning from instructional messages such as oral communication, writing and graphics. Students are able to understand a new knowledge when it is able to establish a relationship between the integrated new knowledge and cognitive schemes that have been available to him. It can be said, in mathematics, a person said to be enriched if students are able to know the understanding of concepts, principles, procedures adapted to solve a problem is presented. According to the curriculum in 2006, an indicator a person is said to have an understanding of concepts in mathematics, namely:

1. Declare re a concept is the ability of students to express what has been communicated to him
2. Classify objects according to certain properties (in accordance with the concept) is the ability of students to be able to classify objects according to their properties
3. Provide examples and counterexamples of the concept is the ability of students to discern example and not an example of a material that has been studied
4. Present the concepts in a variety of forms of mathematical representation is students ability in draw or make graphics, make matamatis expression, compose stories or written text
5. Develop a necessary or sufficient condition of a concept is the ability to assess students where necessary or sufficient condition of a related concept
6. Use, utilize, and selecting a particular procedure or surgery is the ability of students to solve problems correctly in accordance with the procedure
7. Apply the concept or algorithm is a problem solving ability of students to use concepts and procedures in solving problems related to everyday life

Problem Solving Ability

According Hudojo (2005) is a problem solving process of acceptance problems as challenges to solve the problem. Problem solving ability for the students to learn. The teacher presents a problem and students solve problems, to solve problems that students can practice and integrate the concepts, theorems and skills that have been learned. In solving the problem the students are expected to understand the process of solving the problem and become skilled in selecting and identifying relevant concepts condition clan, looking for generalizations, formulate a plan and organize the completion of the skills that have been previously owned. According to Polya (Hudojo : 2005), solving the problem in an effort to find a way out of a difficulty, achieve a goal which is not immediately achievable. In addition, according to Polya (1957), problem solving consists of four basic steps, namely:

1. Understanding the problem, in this stage the students are guided in order to clearly understand a problem it faces, obtaining a complete picture of what is known and what is being asked and asked where there are things that are less obvious in the problem
2. Develop a plan/ implement completion, students are guided in this stage in order to identify and afford to turn a problem into a problem more clearly, and prepare a variety of strategies or methods to be used at a later stage. Students at this stage is strongly influenced by his experience in solving the problem, they are generally

more varied experience, there is a tendency students more creative in drafting/completion plan/ solution of solving a problem. In the learning process, students can be said that the completion of the plan the student is able to make a systematic step-by- step solution.

3. Implement plan/calculation, if the settlement plan has been drawn up, then performed problem resolution in accordance with the plans that are considered most appropriate. In solving the problem the student is given the opportunity to use other alternatives in solving the problem or how to solve the problem may be more than one possible answer

4. Checking back, in this stage the students are guided to examine whether the process and the results are done properly and correctly. In this way, the errors that may exist in the three previous stages will be corrected and returned so that the student can solve the problem exactly

RESEARCH METHOD

The study looked at the effect of cooperative learning model approach stad with realistic mathematics education (RME), pairs check, and inquiry be compared expository learning againts to the understanding of concepts and understanding of problem solving ability of students 4th semester of the school year 2013/2014, this study is an experimental study. Randomized study design design-posttest control group Preetest taken involving two groups, the experimental class is a class 4A, 4C, 4D and 4E as a control class.

Class	Pretest	Treatment	Postest
Experiment	O_1	X	O_2
control	O_3	-	O_4

$O_{1.3}$: Pretes
X : Treatment with RME, Pairs Check, Inquiry
$O_{2.4}$: Postes

The procedure of this study are:
1. Grouping students according to the results of initial tests and the results of math ability in the experimental class, which is in the category of low, medium, high.
2. Perform learning with RME, Pairs Check, Inquiry at experimental classes
3. Provide post-test for the experimental and control classes.
4. Analyze data using parametric statistical tests which one-way anova

RESEARCH FINDINGS

First: based on data analysis data showed that the calculated F value of 54.606 is greater than the value of F table which are 3.32 (5% significance level) and 5.39 (1% significance level) this means that there are differences in understanding the concept of using student learning STAD cooperative with RME, Pairs Check, and inquiry. Furthermore, based on one-way ANOVA analysis of the average difference between groups showed that the highest average was in the RME group is 8.548, the average check pairs 1.975, and 6.591 inquiry average, this means that learning is best EMR in improving the understanding of the concept students.

Second: based on data analysis data showed that the calculated F value of 52.87 is greater than the value of F table which are 3.32 (5% significance level) and 5.39 (1% significance level) this means that there are differences in mathematical problem solving ability by students who use STAD cooperative learning with RME, Pairs Check, and inquiry. Furthermore, based on one-way ANOVA analysis of the average difference between groups showed that the highest average was in the RME group is 7.542, the average check pairs 0.975, and 5.873 average inquiry. this means learning best EMR in improving students ability in solving mathematical problems.

Third: the difference in average test results in a linear program material between the two study samples, in which the experimental class averages above 70. For a class that uses the average RME learning outcomes 79.08, Pairs check class that uses the average learning outcomes 73.45, the class that uses the average of inquiry learning outcomes 75. the good category, while in the control class average is still below 70. From the above, it can be seen that the STAD cooperative learning with RME, Pairs Check, inquiry and positive effect on problem solving ability and understanding of the concept of the student on the linear program material.

CONCLUSION AND SUGGESTION

Based on the research and analysis of data on research findings obtained a description of significant differences between the understanding of math concepts and solving abilities possessed by the student with STAD cooperative learning using RME, learning outcomes Pairs check, and inquiry. The best approach to improve the understanding of math concepts and solving skills in accordance with the highest average is to use RME, whereas poor approach in teaching is to pairs check. Student learning outcomes in the experimental class above the control class that is more than the value of 70.

The recommended advice is preferably in the conduct of STAD using the RME approach, pairs check, and the inquiry conducted by a lecturer / teacher, to avoid the possibility of outside factors that affect learning such as factor of lecturer who became the idol of the students. In addition, because there are three independent variables, the instruments are being used more and be well prepared. Learning to check the results are much different pairs with two other learning. Because of the characteristics of learning pairs check did not significantly affect the understanding of concepts and problem solving skills, it is also a flaw that must be corrected in the technical implementation.

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