

IMPROVING OF STUDENTS MATHEMATICAL REASONING ABILITY BY APPLYING REALISTIC MATHEMATICS EDUCATION ON APPROACH SUBJECT SETS IN VII GRADESMP NEGERI 1 BINJAI

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ABSTRACT

The aim of this research is to improve students' mathematics reasoning in class VII SMP Negeri 1 Binjai in Sets topic by using realistic mathematic education. Subject on this research is students in class VII-7 SMP which total students is 36 students and object this research is process and learning outcomes in improvement of mathematic reasoning ability through realistic mathematic education. Instrument of this research are observation, interview, and test. This research is Class Action Research (CAR) which is divided into 2 cycles, This research had done in two cycles which each cycle had two meetings and the end of each meeting was given mathematical reasoning ability test. From cycle I, the average score of mathematics reasoning test I 67,90 and there are 24 students of 36 students individually accomplished and classically mastery learning is 67%, this shows that students' reasoning ability still low. In implementation of cycle II from score of mathematic reasoning test II got the average score of mathematic reasoning test II is 75,16 and classically mastery learning has achieved 89% or 32 students has completed the learning individually. Based on this research result is obtained that learning by using realistic mathematic education in the topic of sets can improve students' mathematic reasoning. Based on criteria of classical mastery learning then this learning has achieved the target of mastery learning. The improvement can be concluded that through realistic learning, the mathematic reasoning ability in sets topic in class VII has improved. The suggestion which is recommended that teacher able to implemented the realistic mathematic education as alternative in learning process which can improve the students reasoning ability.

Keywords : Class Action Research, reasoning, realisc mathematic education

Introduction

Education is a conscious and deliberate effort to create an atmosphere of learning and the learning process so that learners are actively developing the potential for him to have the spiritual strength of religious, self-control, personality, intelligence, noble character, and the skills needed themselves

and society. The role of mathematics and mathematics education in the common goal of preparing students to be able to face changes in circumstances that are developed through critical action research base, rational and careful, and could use a good mind set in learning mathematics and science in everyday life.

Based on the objective of mathematics learning, can be said that learning mathematic not only enough be able to computation

mathematic, but should be mathematics learning become meaningful learning where students can use his ability and curiosity independently, and not look mathematics as an abstract thing. Mathematics should be able to imagined by student, so that student can understand mathematics concept very well. Moreover, mathematics education in Indonesia has seen the development of mathematical thinking skills, especially the second goal is the reasoning. Reasoning is a mental process or activity in the developing minds of some facts or principles, and the results of the mental processes of knowledge or conclusions.

Based on the above quote Realistic Mathematics Education (RME) on approach is not only used to illustrate the application and the reality in the real world, but as a resource for learning mathematics itself. Given the context of the real world that is already known by the students. The most important thing that is real enough for students to be able to engage with them so that they can solve

the problem that makes sense. So from the above statement implies that the RME is a learning does not start from the definitions, theorems, or the properties and then followed by examples, as it has been implemented in various schools. However, the properties, definitions and theorems that are expected as though it was rediscovered by the students through the completion of a given contextual teachers in early learning. In other words the RME on approach students are encouraged or challenged to actively work, even expected to construct or build their own knowledge gained and try to use logic to think or reason in constructing knowledge.

The objective research are to know the improvement of students mathematical reasoning ability who studied by realistic mathematic approach, to know the effectiveness of realistic mathematic approach in increasing students, and to know implement realistic mathematics approach so that be able to improve of students mathematical reasoning ability.

Research Method

This research is a classroom action research (CAR). CAR is defined as a form of reflective study by the perpetrators. The measures taken to improve the stability of rational action research in carrying out daily tasks, deepen the understanding of the actions undertaken, as well as improve the conditions in which learning practices are carried out. The place that choosen as research location in SMP NEGERI 1 BINJAI at the odd semester. In this research that become research subject is student class VII in the even semester academic year 2014/2015 with the number of students are 36 students, consisting 18 boys and 18 girls. The Research object in this research is all of process and mathematic learning outcomes in improving mathematical reasoning ability through realistic mathematics education in VII grade student SMP NEGERI 1 BINJAI. Initial stages prior to this research is a preliminary research carried out in the form of interview and tests. After interviews with mathematics teachers in SMP Negeri 1 Binjai That Mrs. Agustina, S.Pd Carried observation of student scores at follow Formative Test. By observing the results of diagnostic test students, showed that students who are low reasoning ability that led to the failure of students to solve problems. After the researchers took the questions and answers are done by the students to demonstrate the extent of students' reasoning abilities are represented by one student. Apparently, the results found that students' reasoning ability is low it can be seen that the students do not understand the concept of Ratio and Proportion so that students are not able to take the right conclusions from the existing statement.

Based on interviews with teachers in mathematics can seemingly passive information that the students in learning, which is why students are less interested in using logical thinking skills. Class action procedure consists of cycles. In one cycle consists of five stages: (1) planning the action, (2) Implementation of the action, (3) Observation, (4) data analysis, (5) Reflection. Then proceed with the implementation of the

follow-up. For more details of this class action procedure is cycle I and cycle II. There are two meetings in every cycle. This is the scheme of class action reaserach :

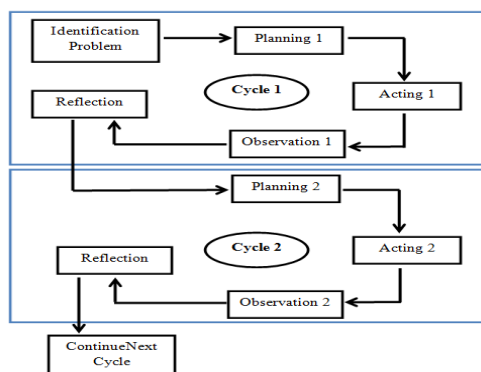


Figure. 1 The main procedures of Classroom Action Research (source : Richard Sagor, 2005 : 7)

In this research, instrument that used to collect data consist of test instrument and non test instrument. Observations made an observation of all activities and changes that occur at the time of the granting act. In this case the mathematics teacher acts as an observer (observer) whose job is to observe the researcher (who acted as a teacher) during learning activities. Observation sheet can be found in appendix. To get more accurate information, it will be carried out interviews with students and teachers randomly selected mathematics. The interview is the method or methods used to get answers to frequently asked questions unilateral response. Data analysis technique is method that used to investigate problem from data that has gotten. In this research, to analyze data is done are data reduction, data explanation, and the Improvement of Mathematical Reasoning.

1. Data Analysis of Observation Result

After observation is conducted by observer, the data of observation of teacher activities are obtained then analyzed by formula :

$$P_i = \frac{\text{number of aspect that observed}}{\text{many aspect that observed}}$$

Where : P_i = observation result on i-th meeting. Criteria observation assessment according to Soegito (in harefa, 2001:37) are

- 0 ≤ Very bad ≤ 1,1
- 1,2 ≤ less good ≤ 2,1
- 2,2 ≤ good ≤ 3,1
- 3,2 ≤ very good ≤ 4,0

Learning will be effective if the observation result by observer including in good category or very good category

2. Theresult of mathematical reasoning ability test

From the score of students' mathematical reasoning ability test, the data is processed to find the percentage of student mathematical reasoning level individually by using formula :

$$MRS = \frac{\text{Gained Score}}{\text{Maximal Score}} \times 100$$

Note : MRS = Percentage of student mathematical reasoning

Gaining score is used to know the improvement of students' achievement before and after leraning. Gaining score is getting in cycles, for instance in cyle one and cycle two.. It means that we plan have two cycle in this research, there are two score get from two cycle. So to get gaining score we substract second cycle score to the first cycle score.

Then, to get the percentage of mathematical reasoning ability generally formulated as follow :

$$PMRA_i = \frac{\text{Student score}}{\text{Total Score}} \times 100\%$$

Note :PMRA_i= Percentage of Mathematical Reasoning Ability for each meeting

Where :

To scale of mathematical reasoning ability criteria that used is:

- 90% ≤ PMR ≤ 100% = Reasoning ability is very high
- 80% ≤ PMR ≤ 89% = Reasoning ability is high
- 65% ≤ PMR ≤ 79% = Reasoning ability is middle
- 55% ≤ PMR ≤ 64% = Reasoning ability is low
- 0% ≤ PMR ≤ 54% = Reasoning ability is very low

b. The Classical Mastery Learning

To determine the individual mastery learning of student, the gained score of students' reasoning test must be greater or equal to minimum completeness criteria is 75. To determine the classical learning completeness can be formulated as follow :

$$PCC = \frac{\text{Number of student with } LC \geq 75}{\text{Number of Student}} \times 100\%$$

Note : PCC = Percentage of Classical Completeness

Based on Department of Culture and Education (Depdikbud) in Trianto, 2009 : 241 proposed that a class is considered have completed in learning if one class there are 85% has already achieved $LC \geq 75$.

c. Classical Average Score

To count the classical average score using this following formula

$$\bar{X} = \frac{\sum_{i=1}^n X_i}{n}$$

Where \bar{X} = Average

X_i = i-th score

n = number of student

Guidance that will be in used in classification of student's reasoning score in low category, middle, or high category as following :

Table 1. Guidance of Student's Average Score

Average Score of Reasoning	Category
$66,68 \leq \bar{X} \leq 100$	High
$33,44 \leq \bar{X} \leq 66,67$	Middle
$0 \leq \bar{X} \leq 33,33$	Low

d. Success Criteria of SAW

A group is considered to be completed when they are completing the student activity worksheet with score ≥ 75 , and the worksheet was success when the number of students in group who completed the test are being increased. The completeness criteria of SAW as following :

0 – 3 group : poorly

4 – 7 group : good

3. The Improvement of Mathematical Reasoning

The assessment of improvement of student's mathematical reasoning can be used the formula from Meltzer (2002 : 126)

$$gain = \frac{\text{Score pos test} - \text{score pre test}}{\text{score maximum} - \text{score pretest}}$$

Note : maximum score = 100

The range of gain index of mathematical reasoning improvement category as following :

Table 2. Increasing Criteria of Mathematical Reasoning

G Score	Increasing Criteria
$g > 70$	High
$0,30 < g > 0,70$	Medium
$g \leq 0,30$	Low

To avoid the happening of the different interpretation to the terms that used in this research, therefore need to presented operational defenition as follows : (1) Mathematical resoning ability that mean in this research is : 1) propose conjecture; 2) doing mathematic manipulation; 3) giving explanation and fact characteristic, relation, or pattern that exist; 4) collect conclusion; 5) the ability of solving mathematics problem by following logic arguments. (2) Realistic mathematics education is an approach in mathematics learning that many benefitted imaginable situation. Realistic approach based on five characteristics, they are : 1) phenomenological exploration or the use of context; 2) the use of models for progressive mathematicalization; 3) the use of students own production and construction; 4) interactivity; 5) the intertwining of various learning stands or unit.

Research Result and Discussion

The results that will be described on this section are the results of tests and non test, include first cycle and second cycle. The result of a test is assessment of reasoning ability on the material sets, whereas the results of non test are observation and documentation. The test result is described into quantitative form, whereas non test research results described into descriptive qualitative. The first cycle is beginning action of the improvement of reasoning ability research on sets by using realistic learning. At the first cycle, there are two test that's are initial test and reasoning test I. The data that will be obtained from learning implementation on sets in cycle I consisting of test and non test. The result test of cycle I is the result of reasoning ability test whereas non test result consisting of observation result and documentation. Both of result will be described as follows :This is result of initial test (test I) in the first cycle. From 36 students, there are 0 students (0%) have very-high level of reasoning ability, 1 students (3%) have the high-level of reasoning ability, 12 students (36%) have medium-level reasoning ability, 10 students (28%) have low-level reasoning ability, and 13 students (36%) have very-low level of reasoning ability. The data about result of reasoning ability test cycle I can be obviously seen by this following pie chart

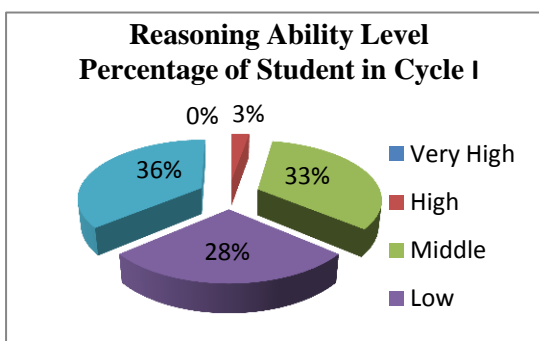


Figure 2. Reasoning Ability Level Percentage of Student in Cycle I

After students done do initial test and teacher get the result. See that the result of students reasoning is not complete so teacher learned the topics about the test before and give the same test from the same topics to students. The result after learned the topics (test II) From 36 students, there are 4 students (11%) have very-high level of reasoning ability, 9 students (25%) have the high-level of reasoning ability, 11 students (31%) have medium-level reasoning ability, 6 students (6%) have low-level reasoning ability, and 6 students (17%) have very-low level of reasoning ability. The data about result of reasoning ability test cycle II can be obviously seen by this following pie chart :

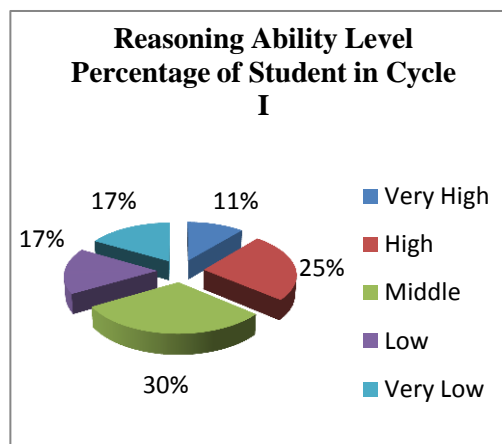


Figure 3. Pie Chart Reasoning Ability Level Percentage of Student in Cycle I

Based on reasoning ability test I and reasoning ability test II in cycle I, the improvement of student's average score can be classified into low category. The clear result can be seen by this following table :

Table 3. Increasing Criteria of Reasoning Ability of Student

Class Score in RA I	Class Score in RA II	G score	Increasing criteria
56.12	67.9	0.26	Low

The increasing of complete student also can be seen by this following

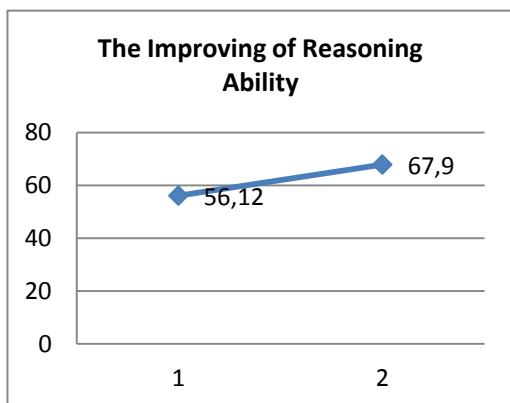


Figure 4 Increasing Criteria of Reasoning Ability of Student

Because the result in cycle I is not satisfied so the cycle continue in cycle II. Teacher give explanation about the topics and give test to students. Test in cycle II is the reasoning ability test III. From 36 students, there are 8 students (11%) have very-high level of reasoning ability, 9 students (25%) have the high-level of reasoning ability, 14 students (39 %) have medium-level reasoning ability, 4 students (11%) have low-level reasoning ability, and 1 students (3%) have very-low level of reasoning ability. The data about result of reasoning ability test III in cycle II can be obviously seen by this following pie chart :

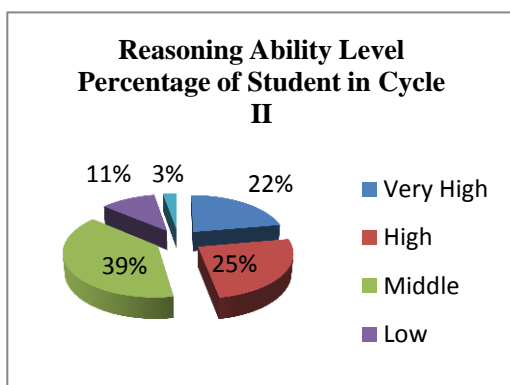


Figure 5 Pie Chart Reasoning Ability Level Percentage of Student in Cycle II

From 36 students, there are 32 students (89%) has already achieved more than 75 point or achieved the mastery learning, while 4

students has not yet achieved point or not complete the mastery learning. Percentage of mastery learning of students in cycle II can be obviously seen by this following pie chart :

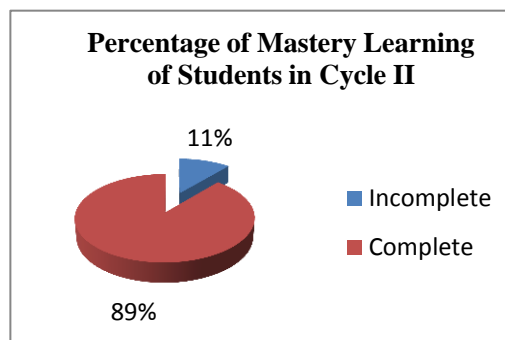


Figure 6. Pie Chart of Percentage of Mastery Learning of Students in Cycle II

From result of cycle II test after learning by realistic mathematic education, the mastery learning criteria classically has achieved 89%, so it is already achieved the targets. Based on cycle I and cycle II, the improvement of student's average score can be classified into low category. The clear result can be seen by this following table :

Table 4. Increasing Criteria of Reasoning Ability of Student

Class Score in cycle I	Class Score in cycle II	G score	Increasing criteria
67,90	75,16	0,31	Medium

The increasing of average score also can be seen in below chart :

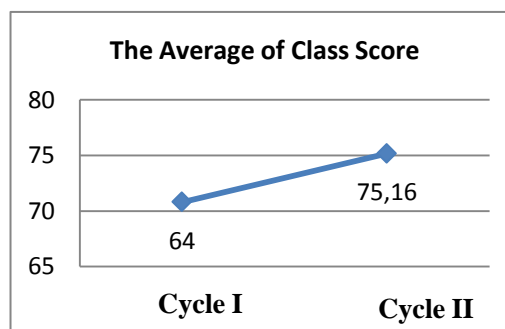


Figure 7. Line Chart of Increasing Average of Class Score

Based on table above, it is found that score mathematic reasoning test in cycle I is 64 and being improved becomes 75,16 in cycle II. By using the gain score to determine the level of improvement that G-score get is 0,31 which are categorized into medium category.

Conclusion

According to all classroom action research implementation, include learning process, analysis result, and observation result can be concluded that as follow :

1. The Improvement of mathematic learning by using realistic mathematic education can improve students' mathematic reasoning. It is given by average score of mathematic reasoning in reasoning mathematic test, in cycle I is 67,90 get improved to be 75,16. the improvement of average score from cycle I to cycle II is 0,14 categorized into low category.
2. From implementation of cycle I from 36 students there are 23 (64%) students achieved the mastery learning and 13 (36%) students are not yet achieved the mastery learning. In cycle II, from 36 students, there are 32 (89%) students achieved the mastery learning and 4 (11%) students are not yet achieved the mastery learning, classically mastery learning in cycle II is 89%.
3. Based on learning process which are implemented in this research and observation result, mathematic learning process by using realistic mathematic education, as we know that realistic mathematics education is an approach of learning. Firstly, teacher give contextual problem and divided students in a group at the learning process . We can see from the syntax of realistic mathematic education. In opening activity's teacher give greetings and some information to students about the matter will be learned. Students answering greeting's teacher and listening some information from the teacher. Then, in core activity's there are five phase must through by students. The five phase are observing (orientation of students on problem),

questioning (organizing students to learn), associating (guiding investigation of individual and group), experiment (Developing and presenting the work), and networking (Analyze and evaluate the problem-solving process). So in every phase use problem to develop students thinking and creativity. After that, closing activity's. in this part teacher an students do reflection from the learning, teacher give homework to students, and teacher give information about next topic to students. In realistic mathematics education has reinvention after learning process. Mathematic learning process by realistic mathematic education get the score is 3,62 which categorized into very good category. Implementation of learning by using realistic mathematics education approach is done by done contextual problem. After give the contextual problems, teacher gives students any moment to understand the problem. After that, teacher guides students to make description based on problem which are happened in their life and then students find the solution by their own way. If students learn in group, teacher also gives any moment to compare and discuss together and decide the best answer. Then, make any conclusions to create mathematic concept. in the end, students get intended knowledge.

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