ME - 28

IMPROVING STUDENTS' MATHEMATICS REASONING AND EMOTIONAL INTELLIGENCE THROUGH MEAS (MODEL-ELICITING ACTIVITIES) INSTRUCTION

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Abstract

This study is a part of research report entitled Developing Senior High Students' Mathematic and Emotional Intelligence and Their Retention by MEAs Instruction. This study is an experiment with pretest-posttest group design which aims at analyzing the effect of MEAs instruction on students' mathematic and emotional intelligence. The population is all eleventh graders of senior high schools in Cimahi, while the sample is purposively chosen from two senior high schools in Cimahi and randomly selected from existing grade XI. Then they are randomly selected to become experiment group and control group. Based on the result, it can be concluded that students' mathematic skill with MEAs instruction is better than conventional instruction. Furthermore, there is no difference in term of emotional intelligence between students who receive MEAs instruction and conventional instruction; however there is a moderate level of association between students' mathematic reasoning and emotional intelligence.

Keywords: Mathematics Reasoning, Emotional Intelligence, MEAs.

INTRODUCTION

Basically, students' mathematic abilities that need to be mastered when learning include problem-solving ability, reasoning ability, communicating ability, connecting ability and representing ability. This is implied in NCTM (Irwandi, 2012) which state that in order to understand and use mathematic it needs mathematical power which includes exploration, reasoning, problem solving, communication, connection and so on so forth.

Whereas the goal of education naturally is a continuity process of solve problems. Mathematical problem especially solved by having high mathematical ability in order to solve the problem well. Yuan (2013) explains that the problem is not the subject; instead the method of solving is the highlight. Reasoning ability is an important skill to understand mathematic. Shadiq (2007) states that reasoning is a thinking activity to draw conclusion or create new statement based on some statements which have been proven to be true or considered true, which is called as *premise*.

It is not easy to reach the goal of education. This might be seen from 2007 TIMMS report, which stated Indonesia ranked 36th from 48 countries. This is also similar with the result of National Exam; students have not shown satisfying result. Beside, Kemendiknas (2010) states from the result of National Final Examination, mathematics is one of the subjects whose level of failure is high for students majoring Social Studies (15.11%) and Religion (28.17%). This is also supported by Ratnaningsih (2007) who claims that most students face difficult in understanding and comprehending mathematics due to the lack of variety of the teachers' method.

To achieve the goal, the question arose is "how to improve the ability of problem-solving, reasoning, connecting, and representing?" The way how this question is answered is based on our belief about learning process (Sanjaya, 2006). Sadirman (2006) states that interaction between students and teacher is expected to be a motivating process. Learning with MEAs (Model-Eliciting Activities) approach is potential to develop mathematic talent; one of them is mathematic reasoning, because they involve the students and complex mathematic tasks which are similar with the tasks applied in complete mathematic.

MEAs is an approach based on reality (contextual) problem, work in small group, and present a model to help students build problem solving and make them implement mathematical concept that has been learned. Goleman (Hamidah, 2010) mentions that emotional intelligence is an individual's intelligence to control his/her emotion, skillful in facing his/her emotion, able to control him/herself, able to motivate him/herself, feel empathy, and social ability. Sukardi (2009) affirms that in the age of high school students tend to look for their identity which most of the time causes emotional problems. Good emotional intelligence can determine a person's academic achievement, build career success, develop harmonic marriage, and reduce aggressiveness, especially in adolescent. The academic achievement relates with mathematic ability aimed in this research, which is mathematic reasoning ability. Therefore, this research aims to improve students' mathematic reasoning and emotional intelligence through MEAs instruction.

Generally the research questions are:
1. Is the junior high students' mathematic reasoning ability with MEAs instruction better that those with conventional instruction?
2. Is the junior high students' emotional intelligence with MEAs instruction better that those with conventional instruction?
3. Is there association between students' mathematic skill and emotional intelligence?

This research aims to investigate deeply the role of MEAs instruction on students' mathematic reasoning achievement and emotional intelligence. Moreover based on the result, it will seek ways to solve the difficulty and next efforts to improve mathematic ability.

Followings are the descriptions of operational terms involved in this research.
1. Mathematic Reasoning is students' ability to predict answer and the solution process of given problem.
2. Emotional Intelligence is students' ability to recognize and manage self emotion, self motivating, recognize others' emotion (empathy) and ability to cooperate with others (social skill).
3. Model-eliciting activities (MEAs) instruction is an instruction based on reality problems, work and discuss in small group, then present a model.

LITERATURE REVIEW
Mathematic Reasoning
Shadiq (2007) states that reasoning is a thinking activity to draw conclusion or create a new statement based on some statements which is acknowledged or considered to be true, known as premise. Meanwhile Hurley (Shadiq, 2007) claims that there are two kinds of reasoning in mathematics; that are deductive reasoning and inductive reasoning. Inductive reasoning is a process of drawing conclusion which is based on some possibilities raised by the premises. Deductive reasoning is a process of reasoning to draw conclusion which the conclusion is drawn absolutely based on the premises and unaffected by other factors.
MEAs Instruction
In MEAs instruction students actively learn to build knowledge (comprehension) through assimilation process (observing new information) and accommodation, this characteristic is considered constructivism (Piaget, in Istianah, 2011). MEAs characteristics also believe in

Vygotsky's perspective (Istianah, 2012) that is the existence of interaction (communication) with environment, stages of giving guidance, support and assist them when they stuck in thinking.

Lesh (Cynthia and Leavitt, 2007) elaborate six principles in designing MEAs, they are: (1) Model Construction principle: problem should be designed in order to allow the model creation which deals with elements, relation and operation among patterns and order that rules the relation of elements, (2) Reality principle: problem should be meaningful and relevant to the students, (3) Self-Assessment principle: students should be able to assess themselves or to measure the advantages of their solution, (4) build documentation principle: students should be able to discover and document their thinking process of their solution, (5) build Shareability and Usability principle: the solution that is made by the students should be able to be generalized or easy to be adapted in other situation, and (6) Effective principle prototype: other people should be able to interpret the solution easily. Furthermore, MEAs instruction stages are identify and simplify problem situation, build mathematic model, transform and complete the model, and identify model.

Emotional Intelligence

According to Salovey (Hamidah, 2010) emotional intelligence is the ability of a person to recognize his/her own emotion, face his/her own emotion, motivate him/herself, empathy, and cooperate with peers. Goleman (Hamidah, 2010) states, emotional intelligence is a person's ability to control his/her emotion life with intelligence, maintain emotion harmony and expression through the ability of self recognition, self control, self motivation, empathy, and social skill. Furthermore, Salovey and Mayer (Hamidah, 2010) define emotional intelligence as part of social intelligence which involves ability to recognize other people's social feeling, sort all of them and use the information to guide mind and action.

Other Relevant Studies

Other related research about mathematic ability is Karim (2010), who reports that mathematic reasoning and critical thinking of junior high students who receive Reciprocal Teaching instruction is better than those with conventional instruction. Other related research deals with MEAs instruction is, among others, Istianah (2011), who reports that students' mathematic critical and creative thinking with MEAs instruction is better than those with conventional instruction. Moreover Martadiputra and Suryadi (2012) report that there is difference of mean of students' statistical disposition between modified MEAs instruction and conventional instruction. The modified MEAs instruction effects significantly on improvement of statistical disposition.

RESEARCH METHOD
Research Design

This research is designed to be experimental control and posttest. The population of this research is all students of senior high school grade XI Cimahi, while the sample is students grade XI of two of the senior high school which is purposively selected and randomly selected from existed grade XI. Therefore the research design is as follow:

Table I. Research Design

Treatment	Post-test$_1$
X1	T1
X2	T2

Explanation:

X1	: MEAs instruction	T1	: Posttest of experiment class
X2	: conventional instruction	T2	: Posttest of control class

Research Procedures
To see the steps of the research it can be seen from Table 2:

Table 2. The steps of the research

Study characteristics	Method	The step of the research	Expectation
Theory, empiric	Theoretical study of documentation	1. Identifying mathematic skill and its retention, emotional intelligence, lesson, and students' initial condition	And students' difficulties
Empirical rational theory	Descriptive analysis study	2. Designing lesson plan and its instruments for research	The design of lesson plan and instrument relate to mathematic skill and MEAs instructional approach
Empirical rational theory	Descriptive analysis study	3. Testing lesson plan and instrument	Lesson plan and mathematic skill test which has been revised
Empirical rational naturalist	Descriptive analysis study	4. Conducting the research in instructional education, analyzing data, instructional analysis, reporting the result, appendix and seminar on the result of the research	The report of research and article for seminar and/or pros siding either national or international

The technique of processing research data
   The classifications of students' ability are high, medium and low achievers in experiment group and control group. The classification of students based on the result of ability given to students before instruction being done which is categorized in the table 3 below:

Table 3. Grouping Category of Students' Initial Mathematic Skill

Interval	Category
$x > (\bar{x} + 0,5\,SD)$	High
$(\bar{x} - 0,5\,SD) \leq x \leq (\bar{x} + 0,5\,SD)$	Medium
$(\bar{x} - 0,5\,SD) < x$	Low

   The second result of the test is measured by using MINITAB 16 software and SPSS 19 by doing the following steps:
1. Counting the mean and standard deviation
2. Measuring normality and sample

3. Measuring deferential
4. Measuring ANOVAs
5. Measuring Chi Square and coefficient configuration

The relation between research question, hypothesis, group of data and statistical measurement used to analyze the data is presented below.

Table 4. The relationship of case, hypothesis, group of data and statistical measured which is used in analyzing the data

case	hypothesis	Group of data	Statistical measurement
Students' mathematic reasoning with PMEAs and PB	1	DM-PMEAs DM-PB	t-test
Students' emotional intelligence with PMEAs and PB	2	KE-PMEAs KE-PB	t-test
Association of students' mathematic skill and students' emotional intelligence to MEAs instruction	3	DM-PMEAs KE-PMEAs	Chi-Square and Coefficient configuration

Explanation:

PMEAs : MEAs instruction
PB : conventional instruction
DM-MEAs : Students' mathematic skill with MEAs instruction
DM-PB : Students' mathematic skill with conventional instruction
KE-MEAs : Students' emotional intelligence with MEAs instruction
KE-PB : Students' emotional intelligence with conventional instruction

RESULT AND DISCUSSION

Here is presented the result of the ability of mathematic reasoning and students' emotional intelligence as the Table 5 below.

Tabel 5. Ability Of Students' Mathematic Reasoning And Students' Emotional Intelligence

The ability and dispassion	Class PMEAs (n=30)		Class PB (n=35)	
	average	SD	enrage	SD
Reasoning	0,59	0,089	0,53	0,057
Emotional intelligence	123,02	9,99	124,79	8,42

Table 5 showed descriptively that the ability of students' mathematic reasoning in experimental group is better than control group. To support the description of increasing the ability of mathematic reasoning that's already explained, to be conducted data analysis on the ability of students' mathematic reasoning through statistical test by using deferential test. And then the data is measured by normality test of students' emotional intelligence mathematic reasoning.

Table 6. Recapitulation of the Result of t-test between MEAs learning and Conventional Learning

Skill and Disposition	Sig.	Interpretation
Logical Mathematical	0.001	Students' Logical mathematical with MEAs learning is better than conventional learning with significance 5%
Emotional Intelligence	0.221	No differences between students' emotional intelligence with MEAs and conventional learning with significance 5%

Based on the analysis result above, it can be interpreted as follows.
1. Students' logical skill whose learning uses MEAs learning is better than conventional learning. In Students' score in MEAs class is categorized as average (59 out of 100). Meanwhile,
2. Regarding to students' emotional intelligence, it can be found that there is no difference between students' emotional intelligence with MEAs learning and conventional learning. Nevertheless, students' emotional intelligence in both classes using conventional learning is categorized as moderate (123.02 and 123.79out of ideal score 168).

The association of existence between students' mathematical intelligence and emotional intelligence was analyzed by using contingency between two variables. The result showed the contingency coefficient (C) for logical mathematical intelligence and emotional intelligence is 0.49 with Sig. 004. It means that there is a significant association with significance 5%. In this analysis, it can also be described that the students' recalling skill with MEAs instruction is moderate (Table 5.8). Besides that, the findings about mathematical intelligence and emotional intelligence showed that students' mathematical intelligence is very important in generating students' emotional intelligence. It can be seen from students whose mathematic intelligence is low but their emotional intelligence is high than the students whose mathematic intelligence is high but their emotional intelligence is low.

CONCLUSION AND SUGGESTION

Conclusion
    This study gives some conclusions as the following.
1. Students' logical mathematical intelligence treated by MEAs is better than those who were treated by conventional learning.
2. There is no difference between students' emotional intelligence treated by MEAs and treated by conventional learning.
3. There is a significant association between students' mathematical intelligence and emotional intelligence.

Suggestion
    There are some suggestions proposed. One of them is the development of students' mathematical intelligence should become a priority for essential mathematic contents and should be followed by preparing learning materials and teachers' aid which is appropriate with students' needs. The development of emotional intelligence should become teacher's focus by conducting habits and giving model to students.

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