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"Breaching international boundaries to share scientific research and advance education"

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Universitas Bengkulu

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Proceeding and Scientific Program: M. Lutfi Firdaus, Ph.D.
Dr. Agus Sundaryono
Dr. Aceng Ruyani

Editor : Annisa Puji Astuti, Hadi Apriyoanda

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Email: fkip@unib.ac.id
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Email: pascapendipa_unib@yahoo.co.id

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10. Implementation Of Mea Mathematics Learning To Improve Students Mathematical Reasoning Ability In Mechanical Engineering S1 University Of Ratu Samban

Noviarita Zulianingsih[1*], Saleh Haji[1]
[1]University of Bengkulu
*Email: noviaritazulianingsih@yahoo.com

ABSTRACT

The purpose of this research is to develop a learning with implementation of MEA mathematics learning to improve students mathematical reasoning ability in mechanical engineering s1 university of ratusamban. The method of this Research is using classroom action. This procedures are only used by four phase of research.that is planning, action, observe and reflection.On the pre-test there is only 1 students who achieve good criteria (B), as mush as 1 student in sufficient criteria (C) and 12 students in less criteria (K). it is seen that the initial ability of students mathematical understanding is still lacking. After a class action with the MEA learning model there is a noticeable improvement from post-test results of cycle I. as many as 4 students in either criterion (B), 10 students in sufficient criteria (C) and no students in less criteria (K). based on these results have increaswd but the action has not been said succesfull, because the success criteria of action has not been achieved. In the success criteria of the action is said to succeed if ≥60% of the total number of students has reached either criterion (B), while in the post-test results of cycle 1 only 4 (28%) students in good criterion (B). so the research continued again to cycle II to improve students mathematical understanding ability. In the post-test results of cycle II, 11 students (78%) achieved good criteria (B), 3 students (22% in sufficient criteria (C) and no students (0%) in less criteria (K).

Keywords: Mathematical Reasoning Ability, MEA Learning

1. Introduction

The term of reasoning (thinking or reasoning) is described by Keraf in [1] as "a thought process that seeks to relate known facts or evidences to a conclusion".According to Fadjar Sadli in [1] reasoning is a process or an activity of thinking to draw a conclusion or thought process in order to make a true new statement based on some statement that has actually been proved or assumed before. Another term of reasoning or explanation is described by Copi in [2] as follows: "Reasoning is a special kind of thinking in which inference takes place, in which conclusions are drawn from premises". Whereas According to [3] reasoning is the process of drawing conclusions from the principles and from the evidence (Leighton, 2004a, 2004b; Leighton & Sternberg, 2004; Sternberg, 2004b; Wason& Johnson-Laird, 1972).According [4] reasoning can be classified into two types, namely inductive reasoning and deductive reasoning. Inductive reasoning can be interpreted as a general or specific conclusion drawing based on observed data. While deductive reasoning is a conclusion based on agreed rules.According to Jihad in [5], several abilities belonging to the mathematical reasoning ability are drawing logical conclusions, giving explanations using models, facts, traits, and relationships, estimating answers and solution processes, using patterns and relationships to analyze mathematical situations, Construct and test conjectures, Formulate opponent examples, Follow inference rules check validity of arguments and Compose valid arguments.

According to [6], provide indicators of abilities that include the ability of reasoning mathematics, namely: (1) make anology and generalization, (2) provide explanations by using the model, (3) use patterns and relationships to analyze the situation of mathematics.

construct and test the conjecture, (5) verify the validity of the argument, (6) establish the direct proof, (7) set up the indirect proof, (8) give an example of denial, and (9) follow the rules of inference.According to RisWiwin in [7] says reasoning abilities include the ability to propose allegations, the ability to manipulate math, and the ability to draw conclusions.According to Johnson and Rising in Suwaningsih revealed that mathematics is a pattern of thinking and organizing patterns of proof that make sense. According to Turmudi, mathematics derives from empirical experience which is then processed rationally and processed by analysis and synthesis with reasoning to produce conclusions in the form of mathematical concepts.Newell and Simon in [8] state that, Develop a type of problem solving based on a more general heuristic strategy, called MEA. Through the MEA model a person facing a problem tries to divide the problem into specific parts of the problem.Newell and Simon in [9] states that "Mends-Ends Analysis is a process for solving a problem into two / more sub-goals and then done in succession to each of those goals."

Etymologically, Means-Ends Analysis consists of three elements of the word Means, Ends, and Analysis. Means means way, meaning Ends purpose, as well as Analysis which means to investigate systematically. [10] suggests that:The MEA learning model is a variation of problem-solving learning with syntax: present materials with heuristic-based problem-solving approaches, elaborate into simpler sub-issues, identify differences in sub-sub-issue arrangements resulting in connectivity, select solution strategies.

2. Methods

The method used in this PIPM is Classroom Action Research. If a person intends to conduct action research including classroom action research, he or she must first design the research [11]. In the classroom action research, the improvements are done gradually and continuously during the research done to the best desired result. Therefore, in classroom action research uses cycles in the conduct of research. Subjects in this study are students majoring in Mechanical Engineering semester 4 academic year 2016/2017. The instruments that will be used to collect data are: (1) Student activity observation sheet (2) student activity observation sheet (4) student response questionnaire (5) result test.The data that have been obtained will be analyzed by: giving preliminary test and post test in every cycle done. Each test is given 5 (five) questions with each question has a maximum score of 4 (four) so that the assessment of the perfection of students in solving the problem is 20 (twenty) or 100% maximum.

3. Results and Discussion

3.1 Results

3.1.1 Cycle I

On post-test data seen as 4 students got good criterion (B) and 10 student got enough criterion (C) and no one got criterion less (K). From 7 indicators of mathematical understanding, there are four indicators in either criterion (B) namely Ability to reiterate the concepts studied, Ability to classify objects based on whether or not fulfilled the requirements that form the concept, Ability to give examples and counter example of the concepts that have been studied, and Ability to present concepts in various forms of mathematical representation. While, the ability to apply the concept algorithm on problem solving, the ability to associate various mathematical concepts, and the ability to develop the necessary conditions and sufficient requirements of a concept in the criteria Enough (C).

3.1.2 Cycle II

in the post-test data cycle II obtained 11 students whose mathematical understanding is categorized into either criterion (B). Likewise with indicators of mathematical understanding that contains 7 indicators, each indicator has been met the criteria of success. So, in this second cycle, the achievement of each indicator of understanding of mathematical concepts has been in accordance with the desired success criteria, namely the indicators of every aspect are in good

criterion (B) and the students' understanding of mathematical concepts has reached 78% of the number of students has reached good criteria B), and 22% of students in sufficient criterion (C), so this study only until cycle II.

3.2 Discussion

Student reasoning test resultsIn a study conducted to determine students' mathematical reasoning abilities, then made a research instrument in the form of test questions consisting of 6 items in the form of a description that each question includes indicators of the ability of mathematical reasoning.Based on pretest, pre-test, post-test of cycle I and end test (post-test) cycle II, it can be seen that there is improvement of students' mathematical reasoning ability. The increase can be seen in the following table:

Table 1. improvement of students' mathematical reasoning ability

No.	Student citeria	Banyaknya mahasiswa Pada Data		
		pre-test	*post-test*cycle I	*post-test*cycle II
1.	good (B)	1	4	11
2.	sufficient (C)	1	10	3
3.	less (K)	12	0	0

In the table above shows that on the pre-test there is only 1 Students who achieve good criteria (B), 1 Students in sufficient criteria (C), and 12 Students in less criteria (K). It is seen that the initial ability of students' mathematical reasoning is still lacking. Improved students' math skills can be seen in the following graph:

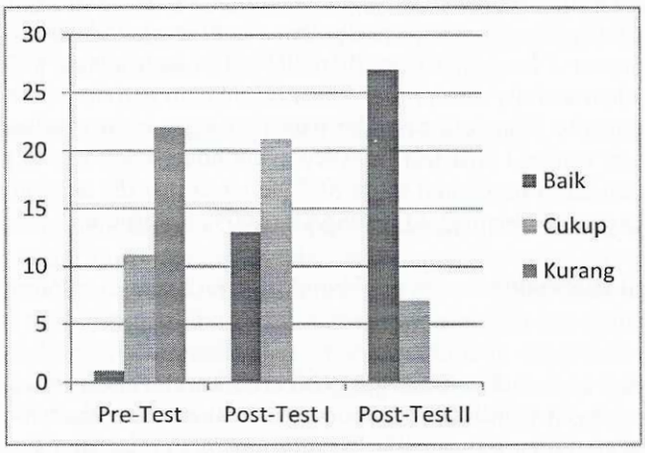


Figure 1. Improved students' math skills

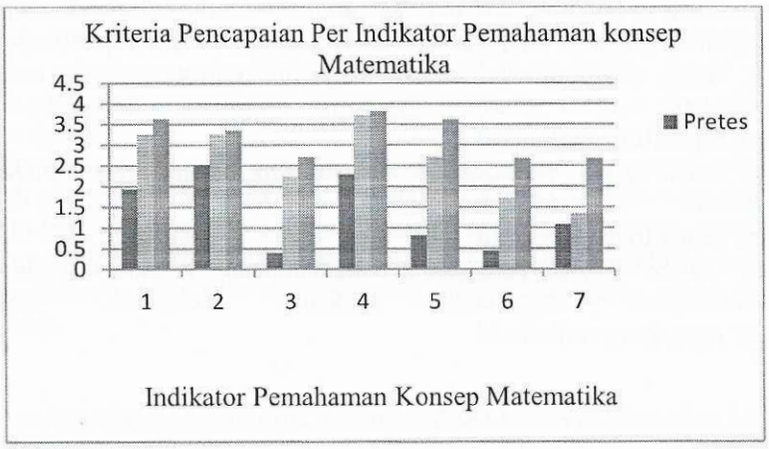
After a class action with the MEA learning model there is a noticeable improvement from post-test results of cycle I, as many as 4 Students in either criterion (B), 10 Students in sufficient criteria (C), and no Student in less criterion (K) . Based on these results have increased but the action has not been said successful. In the success criteria of the action is said to succeed if ≥ 60% of the total number of students has reached either criterion (B), while in the post-test results of cycle I only 4 (28%) Students in good criterion (B). So this research continued again to cycle II to improve students' math reasoning ability. In the post-test results of cycle II. 11 students (78%) achieved good criteria (B), 3 students (22%) in sufficient criteria (C), and no Student (0%) in less criteria (K).

In this class action research, there are 7 criteria indicator of student's mathematical reasoning achievement [12], which can be seen in the following table:

Table 2. 7 criteria indicator of student's mathematical reasoning achievement

No	Criteria	student		
		pre-test	*post-test*cycle I	*post-test*cycle II
1.	Ability to reiterate concepts learned	sufficient (C)	good (B)	good(B)
2.	The ability to classify objects based on whether or not the requirements that form the concept are met	good(B)	good(B)	good(B)
3.	Ability to apply algorithmic concepts on problem solving	sufficient (C)	sufficient(B)	good (B)
4.	Ability to provide examples and counter samples of learned concepts	sufficient (C)	good (B)	good (B)
5.	Ability to present concepts in various forms of mathematical refresentative	less (K)	good (B)	good (B)
6.	Ability to link various mathematical concepts	less (K)	sufficient(C)	good (B)
7.	The ability to develop sufficient terms and conditions adequately from a concept	less (K)	sufficient(C)	good (B)

The pre-test results show that of the seven indicators of students' math reasoning abilities, four indicators in the criteria are lacking, two indicators in sufficient criteria, and one indicator in both criteria. In post-test results of cycle I, three indicators in sufficient criterion (C) and four indicators in either criterion (B). In the post-test results of cycle II, all indicators are in either criterion (B).Based on the success criteria in chapter III, this research is said to be successful. This is seen based on the achievement of each indicator of students' mathematical reasoning ability that has achieved good criterion (B) and there are 12 Students (80%) who successfully achieved good criterion (B). Therefore, this study only until cycle II. Here is a graph of Student Development on the Ability Test of Mathematical reasoning abilities.



Pigure 2. Student Development on the Ability Test of Mathematical reasoning abilities.

4. Conclusion

There is an increase of students' mathematical reasoning ability on differential equation material for undergraduate students of mechanical engineering program of UniversitasRatuSamban. This can be seen in post-test data of cycle I where 4 students got good criterion (B) and 10 students got enough criterion (C) and none got less criterion (K). Achievement of each indicator of students' math reasoning ability that has reached the criterion good (B) and there are 12 Students (80%) who successfully reached the criterion good (B). So it can be concluded that the application of MEA learning model can improve students' understanding of mathematical concepts in Mechanical Engineering Program.

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