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The Influence Of React Strategy Towards Mathematical Belief

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Abstract

The purpose of this study is to determine the effect of REACT learning methods on the result of mathematical belief. This research was conducted at Study Program of Mathematics Education, Prof. DR. HAMKA University. The study design used was treatment by level 2x2, with the independent variable was clearing method namely REACT and conventional methods, the moderator variable was the students initial ability and the dependent variable was mathematical belief. The sampling technique used was cluster random sampling. Firstly, the result of this study was that REACT learning method is effective to improve student mathematical belief so that this learning models can be used in mathematics lecture for prospective teachers. Secondly, learning method has effect on mathematical belief, not relying on the student's initial ability. By giving lecture with REACT method, both students having high initial capability and low initial ability will have higher mathematical belief compared with lecture with conventional method. Thirdly, descriptively, it was found that mathematical belief on Mathematics Education students of Private University is categorized as low.

keyword: REACT method, mathematical belief, initial ability

1. INTRODUCTION

Learning process assessment does not only consider cognitive domain, but also affective and psychomotor domains. Affective domain includes feelings, emotions, mental or psychological. One of affective aspects is mathematical belief. Mathematical belief affects how a student 'welcome' mathematics lessons. Negative belief toward mathematics, such as mathematics is very difficult, very abstract, full of formulas, only can be 'mastered' by genius persons, has made many students anxious redundantly towards mathematics lesson and test. According to Op't Eynd & De Corte [14], belief toward mathematics can influence a person's behavior in learning mathematics and solving problems in mathematics. In terms of teacher, Jinfa et al [8] expressed that mathematical belief will affect how a teacher will teach mathematic and choose learning strategy. Therefore, for mathematics education students, understanding mathematics belief is important, both when they are still becoming students and later when they have entered into society.

Belief is driving force in doing things, and becoming the base in acting. Belief has an important role in removing doubts which may hinder a person in doing activity and generates a certain attitude in acting. Kloostermaan [10], saw a direct correlation between one’s belief and effort. According to Chapman [2], belief is the basis for learning.

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Mathematics is taught in class gradually and it affect the students' mathematical belief, which later, it will affect how students receive such lecturing materials. There are three aspects that simultaneously affect mathematical beliefs, they are mathematics education objects, classroom context, and themselves [5]. These three aspects are interrelated, therefore, to improve students' mathematical belief, it is necessary to pay attention to each student's condition, classroom situation in general, interaction between students, mathematics handbooks, teachers and teaching methods used in classroom.

Mathematical belief is important to improve especially for mathematics education students to be more optimistic in overcoming difficulties. Therefore, it requires a learning strategy that is able to provide a significance of learning for students, in order to participate actively in learning. One of learning models that make students active, as stated by CORD (1999), is CTL (Contextual Teaching and Learning) learning method with REACT strategy.

Learning with REACT strategy was proposed by CORD (Center for Occupational Research and Development) in United States. According to Abdussakir and Achadiyah [1] REACT strategy contains five components, namely "Relating, Experiencing, Applying, Cooperating, Transferring". Relating is learning by associating material being studied with the context of real-life experience or previous knowledge. Experiencing is learning that makes students learn by doing mathematics activities through exploration, discovery and searching. Various experience in classroom may include the use of manipulative, problem solving, and laboratory activities. Applying is learning by applying concepts that have been studied for use, by providing exercises that are realistic and relevant. Cooperating is learning by conditioning students to collaborate, share, respond and communicate with the other students. Then, Transferring by encouraging mathematics students to learn using the knowledge they have learned into a new context or situation that has not been studied in the classroom based their understanding. CTL Learning with REACT strategy requires students to be active in learning so that the students' memory on what have been learned will last longer.

In addition to learning strategy, other things that need attention for the success of student learning is individual differences, i.e initial ability. These differences certainly influence the material acceptance of each student, so that it also affect mathematics problem-solving abilities and mathematical belief. Basically, the students' ability is seen as experience, conditions and potential that have been owned by the students. In line with the opinion of Hailikari [7] that initial knowledge is knowledge and skills that have been owned by someone before executing a specific learning task. Initial ability is prerequisite knowledge in learning new knowledge. The higher initial ability of a student, the easier the students receive new knowledge. Therefore, it is important for a lecture to know the students' initial ability in order to serve as the basis for developing learning process.

If associated with lecturing process, each course has prerequisite subjects. A students that will take a particular course in the next semester must pass the courses in the previous semester. It is the initial ability that will be the base in understanding and following the subsequent course. For Linear Program course, students must pass Linear Algebra course that involves elementary row operations, linear equations and linear inequalities.

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2. METHODS

This study was experimental in which the dependent variable was mathematical belief and independent variables were treatment and moderator. Treatment variables consisted of learning with REACT strategy (A_1) and conventional learning (A_2). Moderator variable was the students' initial ability consisting of high initial ability (B_1) and low initial ability (B_2). The study design used treatment by level.

Table 1: Study Design with Treatment by Level 2x2

Initial Ability (B)	**Learning Model (A)**	
	REACT (A_1)	**Conventional (A_2)**
Low (B1)	A_1B_1	A_2B_1
High (B2)	A_1B_2	A_2B_2

Remark:

A_1B_1 = Mathematical belief score for group of students receiving learning with method REACT with high initial ability.
A_1B_2 = Mathematical belief score for group of students receiving learning with method REACT with low initial ability.
A_2B_1 = Mathematical belief score for group of students receiving conventional learning with high initial ability..
A_2B_2 = Mathematical belief score for group of students receiving conventional learning with low initial ability.

The target population of this study was the entire students of Mathematics Education in Jakarta on academic year of 2013/2014. The accessible population was Mathematics Education students, Prof. Dr. Hamka Muhammadiyah Univeristy Selection. Sampling technique was performed with Cluster Randomized Sampling. Randomization was done by drawing courses on accessible population and it felt to linear program course. Students who followed this course were 5 class. Of 5 classes,
2 students and class 4-C consisted of 41 students. The two classes, were randomly assigned to be experimental class and control class, class 4-B as experimental class receiving learning with REACT strategy and class 4-C as control class with conventional learning. Then after conducting initial capability test, the categorization of group of with high initial ability and group with low initial ability is done by arranging the order of respondents based on the score of the initial test results obtained, from the highest score to the lowest score. To categorize high group and low group S. Dragon (2012) suggests that, to determine the size of high group and low group is $33\frac{1}{3}\%$ ($M_T = M_R = 33\frac{1}{3}\%$) in which this score is quite contrast and reliable. Thus, this study sample consisted of two classes, each class was divided into two groups, by taking $33\frac{1}{3}\%$ of students having high initial ability and $33\frac{1}{3}\%$ of students having low initial ability. The sample distribution can be seen in Table 3.2 below:

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Table 3.2 Sample Distribution in Each Class

Initial Ability(B)	**Learning Model (A)**		**Total**
	Learning with *REACT* Strategy (A_1)	**Conventional Learning (A_2)**	
High (B_1)	13 persons	12 persons	25 persons
Low (B_2)	13 persons	13 persons	26 persons
Total	26 persons	25 persons	51 persons

Belief instrument developed was Likert scale with 5 options consisting of 47 valid items. The instruments consisted of five indicators, namely the certainty of knowledge, the role of lecturer, systematic process, innate ability, quick learning. The respondents' responses were analyzed to test the construct validation using factor analysis with the results. Value of $KMO = 0{,}732 > 0{,}7$ means the mathematical belief instrument is acceptable. Extraction (PCA), Eigen value is 5 factors. The result of *Rotated Component Matrix*, with loading factor criteria < 0.30 and > -0, 30, means that point 11 is deciduous (not valid), so that only 47 items that are valid and can be used as measuring tool.

Instrument to test initial ability was essay test. This instrument measured the material of elementary row operations, linear equations and inequalities. Respondents' responses were validated by 18 panelists to see the conformity with the indicator, the validity of material, construction and language. To calculate the validity, tests was carried out using formulation developed by Lawse (Dragon, 2012: 316). The validity test results showed that the four questions on initial ability $CVR > 0{,}05$ were valid.

3. RESULTS

Table 1, shows that the students' average mathematical belief score for groups A_1 and A_2 are 67.81 and 64.81, group A_1B_1, A_1B_2, A_2B_1 and A_2B_2 are 68.85, 66.77; 66.17 and 63.31 respectively. It appears that the students' average mathematical belief score is ranging from 63 to 69. These scores do not differ much. Therefore, descriptively it can be concluded that the average mathematical belief score of groups A_1 and A_2 is almost the same, as well as group A_1B_1, A_1B_2, A_2B_1. Unlike the others, group A_2B_2 have mathematical belief scores slightly different because the difference in average ranging from 3 to 4.

Table 1 Average Mathematical belief Score

Initial Ability	**Statistics**	**Learning Model**	
		REACT Strategy	**Conventional**
High (B1)	Average N	13 68.85	12 66.17
Low (B2)	Average N	13 66.77	13 63.31
Total	Average N	26 67.81	25 64.81

Figure 1 shows the mathematical belief score for group A_2B_2 is more homogeneous than group A_1B_1, A_1B_2 and A_2B_1 and its distribution is positive.

Distribution of mathematical belief score for group A_2B_1 is more homogeneous than group A_2B_1 and A_2B_2 and its distribution is positive. The distribution of mathematical belief score of group A_1B_2 is more homogeneous than group A_1B_1 and its distribution is symmetry. Meanwhile, the distribution of A_1B_1 is negative. Distribution of mathematical belief for group A_2 is more homogeneous than group A_1 and the both groups distribution is positive. This means that most of the students mathematical belief scores in group A_1B_1, A_2B_1, A_2B_2, A_1 and A_2 are low. Thus, it can be concluded that most of the students belief score are in low group or mathematical belief score of group A_1B_1, A_2B_1, A_2B_2, A_1 and A_2 are below the theoretical median value i.e 141.

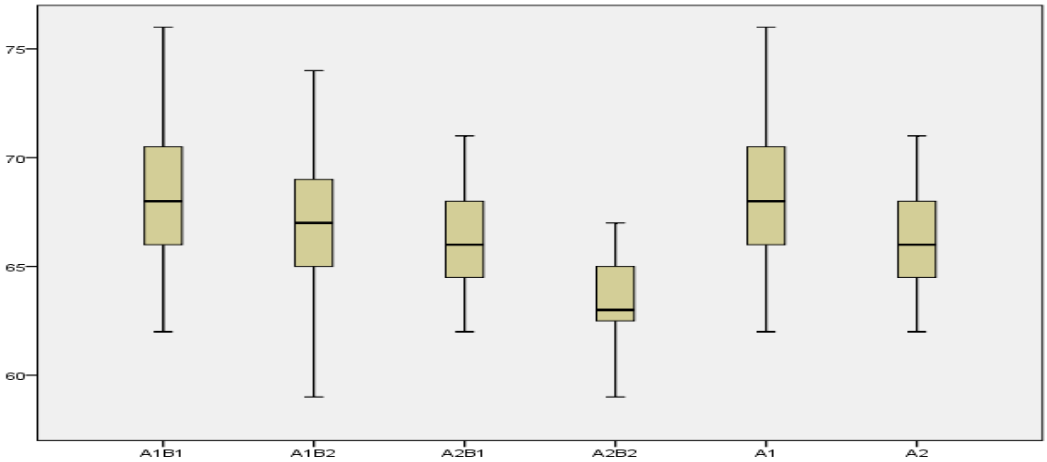

Figure 1 Distribution of Mathematical Belief Scores

Results of two-way ANOVA analysis, comparing mathematical belief scores in group A_1 and A_2 and it obtained that sig. value = 0.009 <α = 0.05 and average mathematics belief score of group A_1 is higher than group A_2. This means that the students' mathematical belief score in group receiving REACT method (A_1) is higher than that mathematical belief scores receiving conventional method (A_2). The results of interaction test between learning method and initial ability (A*B) obtained sign. value = 0.666 > α = 0.05, it means that there is no correlation between learning methods and initial ability with mathematical belief score.

4. DISCUSSION

The first finding of this study is that mathematical belief score in student group receiving REACT method (A_1) is higher than mathematical belief score in student group receiving conventional method (A_2). It shows that learning with REACT strategy is more effective to improve mathematical belief. Learning with REACT strategy (Relating, Experiencing, Applying, Cooperating, Transferring) emphasis on student activity in connecting, applying, transferring knowledge cooperatively to discover and solve problems. To get new information, students are required to cooperate in the process of group discussion. With group discussions, students will help each other in learning materials, thus increasing mathematical belief. Dimyati and Mudjiono [4], "With interaction with environment, intellectual function is growing". Thus, through discussion, students can work together to share experiences, knowledge and resolve difficult issues so that the students' mathematical belief can be increased.

The results of each group discussion are presented in front of the lecturer and other students (Transferring). According to Muijs and Reynolds [11], providing opportunity for students to present their ideas, arguments and defend them publicly will help to sharpen their thoughts on such topic. When students are able to master a lesson topic in a learning process, their mathematical belief will increase. Nurmi, et al, [13] stated that mathematical belief and mathematics learning are interrelated to form a circular process. So, the more varied and effective a learning is, the higher mathematical problem-solving ability and mathematical belief.

In conventional learning, students become the object and the lecture becomes the only source of knowledge. The happening learning process does not provide room for students to be involved in problem solving activities, because students are just listening to what the lecture explained. This such learning will make the students' mathematical belief is low. In addition, the monotony learning will make the learning process boring and tiring and it will have negative effect on mathematical belief. Based on the above description, it shows that students receiving learning with REACT strategy (Relating, Experiencing, Applying, Cooperating, Transferring) is more likely to increase mathematics belief higher than students receiving conventional learning. The validity of such reason is supported by empirical data of the achievement of average mathematical belief score which is higher than average score of mathematics belief. Therefore, in order to increase students' mathematical belief, lecturer should apply learning with REACT strategy.

Second finding of this study is that there is no interaction between correlation model and initial ability toward the students mathematics belief. It shows that the influence of learning with REACT model toward students does not depend on the students initial ability. On Table 1 it can be seen that the students' average mathematical belief with high and low initial ability receiving learning with REACT strategy is higher than that of conventional group. In this learning, students are positioned as equal so that in together they can transform themselves, be self-opened to receive different thoughts. Learning belief is not innate but develops through socialization processes followed with active construction of such individual, a belief system is strongly influenced by cultural values [9]. REACT learning method requires students to be active in shaping their own knowledge. The cooperation process that occurs in learning with REACT strategy will provide a significant impact on mathematical belief, because, despite they have low initial ability, students will be able to follow the course by means of discussion groups, whereas the students with high initial -ability will increase their belief in learning.

Conventional learning will resulted in tiring effect on the occurring learning process, students who have low or high initial ability will not be able to develop ability they have had. The feeling on mathematics that is difficult and even boring will grow, because belief is influenced by a person's emotions. Where belief in oneself can be formed from emotion and becomes an attitude that affects the belief that will determine value/moral [6]. The boring lessons will improve displeasure, it will make mathematical belief becomes lower, although the students have a high initial ability.

The third finding of this research is that most of students have low belief. Table 1 shows the average value of the two-class research that is 67.81 for the study group with REACT strategy and 64.81 for the group with conventional learning. The results when analyzed more deeply through interview to some students, show that during 12 year-learning in school, it still give effect to mathematical belief. Learning in school is usually only to meet the target of achieving curriculum rather than material mastery

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target. It can be tedious, dangerous, and damaging the entire interest of students [15]. Negative feelings will make students become unexcited to do tasks and felt that mathematics is difficult, scary and not everyone can do it. The fear develops into anxiety when learning mathematics. It affects up to college, students often experience anxiety, especially when faced with mathematics test. When compared with cognitive aspects, improvement of affective aspects such as mathematical belief is more difficult and time consuming. Although it is statistically proved that there are significant differences in mathematical belief between groups receiving learning with REACT strategy and the ones receiving conventional learning, but the average value of two classes are still in the low category.

5. CONCLUSION

Mathematical belief is an important aspect in improving student achievement. Belief in oneself is a basic in understanding and feeling anything, which is gradually becoming a habit or behavior and its development over time will help students in solving problems. Learning with REACT strategy is one of learning models that will help to increase mathematical belief. Learning with REACT strategy requires students to be active in the process of Relating, Experiencing, Applying, Cooperating, Transferring.

Individual differences such as initial ability does not have significant influence on the mathematical belief. For students with high or low initial ability receiving learning with REACT strategy, their average mathematical belief is higher than that receiving conventional learning.

From this study, it is expected that lecturer in providing educational services to students, does not only pay attention to cognitive aspects such as learning outcomes, but also pay attention to affective aspects of mathematics belief. Lecturers are also expected to implement learning with REACT strategy in the lecturing process, to increase mathematical belief, which later will have impact on the improvement of student learning achievement.

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