

The Effect Of Mathematics Self-Efficacy Toward Mathematical Creative Thinking Ability Of SMA Students In Bengkulu City

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Abstract

Creative thinking in Mathematics is combination of logical thinking and divergent thinking, which take note of flexibility, fluency, originality and specification in problem-solving. One of factors that is influential when the students create is Self-Efficacy. The students with low self-efficacy will avoid the challenge tasks, while the students with high self-efficacy have a great desire to do their tasks. This research objective is to know the effect of Mathematics self-efficacy toward Mathematical creative thinking ability of SMA students in Bengkulu City by using regression analysis. The Data of self-efficacy was gotten from self-efficacy scale toward Mathematics. The Subject of the research is the 11th grade students in three State-Upper Secondary Schools (SMA) in Bengkulu City. The result of the research shows that there is significant effect between self-efficacy which were had by the students toward their creative thinking ability.

Key Words: Self Efficacy, Mathematical Creative Thinking Ability

I. INTRODUCTION

Mathematics curriculum in Indonesia (KTSP, 2006) proposed a change of teaching paradigm, from teacher centered to students centered. The curriculum suggested that subject matter should be compiled from the simple concept or routine process up to the more complex and should be accompanied by examples of the application, analysis, and synthesis of the concepts. To fulfill that suggestion, teacher should design their teaching approach more innovative, variative and should be constructivism oriented so they will motivate students' activities and creativity during students executed an exploration. Because of that learning and teaching in school must be developed critical and creative mathematical thinking ability.

Critical and creative mathematical thinking ability are important and essential and should be attained by all mathematics students. The possession of those mathematical abilities gave more opportunities for students to be flexible and open-minded and problems. Ability to think creatively will grow well if students learn on his own initiative, given the confidence to think and daring put forward new ideas. Opinions about the ability to think creative shows that the ability to think creatively can

fostered through a study designed so that teachers can train students to explore all the capabilities that exist in him self.

Students' creativity will grow and thrive in learning situation that presents a non-routine problems, free expression to explore, discover, learn in small groups, and solve the problem. In the face of a problem, one must deal with critically and creatively find a solution. So when students doing math skills or mathematical power, to think critically and creatively integrated in there.

To determine a person's ability to think creatively demonstrated through the product of thought or creativity to produce something "new". Munandar (1999) showed indications of creative thinking in its definition that "creativity (creative thinking or divergent thinking) is the ability find many possible answers to a problem, where the emphasis is on quantity, efficiency, and diversity of answers ". This understanding suggests that the more a person's ability to think creatively high, if he is able to show many possible answers to a problem. All answers must be in accordance with the problem and correct. Moreover the answer should vary. Suppose the child is asked to think of use unusual from everyday objects.

Olson (1996) explains that for the purposes of research on thinking creative, creativity (as a product of creative thinking) is often considered to consist of two elements, namely fluency and flexibility (flexibility). Demonstrated fluency with the ability to produce large amounts of problem-solving ideas a smooth and quick. Flexibility refers to the ability to find Different ideas and extraordinary to solve a problem.

Indication of the ability of creative thinking is the same as Munandar (1999) did not shows explicitly the criteria of "new" as something that does not exist previously. "New" is more evident from the diversity (variation) or differences ideas generated.

Williams (in the Al-Khalili, 2005) show features the ability to think creative, namely fluency, flexibility, originality, and elaboration. Fluency is ability to generate ideas or questions in an amount a lot. Flexibility is the ability to produce many kinds of thinking, and easy to move from a certain kind of thinking on the type of Another thought.

Originality is the ability to think in a way new or unique expression, and the ability to produce thoughts that are not prevalent than thinking clearly known. Elaboration is the ability to add or itemize the things that detailed of an object, idea, or situation. These aspects were widely used for measuring creative thinking abilities of a general nature and emphasis the creative product.

In addition to cognitive factors, other things that also influence learning outcomes students are non-cognitive factors. Cognitive factors related to the ability brain in thinking. While the non-cognitive factors are beyond the capabilities ability of the brain in thinking, for example beliefs of students towards mathematics.

Non-cognitive factors that influence the learning outcomes of mathematics students is a factor of affective and metacognitive factors. Affective factor refers to the feelings (feelings) and inclination (mood). There are three factors of affective can affect students' mathematics learning process, namely: faith, attitudes and emotions. Confidence factor will affect the time students do a process of inquiry which is reflected in action, effort, perseverance, flexibility in difference, and the realization of goals. One part of the students' confidence is their self-confidence towards mathematics or self efficacy. It is therefore a need for a self-efficacy to math Strong in the student so that he can succeed in the learning process.

Bandura (1997) postulates four sources of SE information; mastery experiences, vicarious experiences, verbal-social persuasion and physiological and emotional arousal which has to do with the level of emotional and physiological readiness of the individual to undertake a specific task. Although all four sources of SE information play roles in the creation of efficacy beliefs, it is the interpretation of this information that is critical. Cognitive processing determines how the sources of information will be weighed and how they will influence the analysis of the task and the assessment of personal competence.

SE differs from related motivational constructs, such as outcome expectancy, self concept, self-esteem or locus of control, which are more general self-descriptive constructs that incorporate many forms of self-knowledge and self-evaluating feelings (Pajares, 1996). Bandura (1986) argues that SE refers to personal judgments of one's capabilities to organize and execute courses of action to attain *specific* goals, and measuring SE should focus on the level, generality and strength across *specific* activities

and contexts. Therefore, whereas a subject-specific self-concept test item might require the respondent to react to the statement “*I am a good student in Mathematics*”, the SE item would require reaction to the statement “*I can solve percent problems*”. Ignoring of this tenet, leads to insufficient research findings, and that is why Pajares (1996) argues that if the purpose of a study is to find relationships between SE and performance, SE judgments should be consistent with and tailored to the domain of the task under investigation.

The relationship among efficacy, academic motivation and achievement in Mathematics has been widely studied. It was found that SE beliefs appear to be a more important factor influencing attitudes, achievement, and educational and career choices, than other variables such as anxiety, Mathematics experiences, perceptions of Mathematics and self-regulation beliefs (Zimmermann, 2000). It was also found that the influence of SE on Math performance is as strong as is the influence of general mental ability, and that a negative relationship between SE in problem-solving and anxiety occurs (Pajares, 1996). Other studies have reported that SE in problem-solving is a stronger predictor of that performance than anxiety, self-concept or perceived usefulness of Mathematics. It is further argued that the relation of SE to motivation and self-regulated learning can indirectly influence performance in Mathematics (Pintrich, 1999), since students with high level of SE are motivated and confident in their skills, use self-regulatory strategies and achieve better than others. Another finding concerns the reciprocal nature of the relationship between SE and performance; past accomplishments inform currently held SE expectations, which in turn influence task initiation and persistence (Bandura, 1997).

According to Schunk (1987) students with low self-efficacy may avoid a lot of lessons duties, especially duties challenge, whereas students with high self-efficacy has a great desire to do his duties. This is in line with opinion of Siskandar (2004) who argued from the students, especially for students who are capable of average and below average yet achieve the expected standard of competence, so that tends to lose confidence of his ability. This gives a hint that so that students can succeed in doing so he has to have exploration high self-efficacy toward mathematics.

The purpose of our study was to investigate the relationship between mathematics self-efficacy and mathematical creative thinking ability students of Secondary School in Bengkulu using regression analysis. Specifically, the following research question were addressed: (1) was there a significant relationship between mathematics self efficacy and mathematical creative thinking ability; if yes, how large was the correlation coefficient? (2) Could mathematical creative thinking ability students of Secondary School in Bengkulu be significantly predicted by their mathematics self efficacy?

II. METHODOLOGY

The Subject of the research is the 11th grade students in three State-Upper Secondary Schools (SMA) in Bengkulu City. A sample of six intact classes was selected from all of the subject. Self efficacy scales were completed by 211 students. Mathematical creative thinking ability was measured by a specially prepared test.

Preparation of the test aims to measure mathematical creative thinking ability in four aspects, namely fluency, flexibility, originality and elaboration. Material tests are given in the multiplication rule, permutations, combinations and chance of an event. Problem description is shaped as much as 5 questions, each about measuring more than one aspect of mathematical creative thinking ability. The test done after the learning process. Mathematical creative thinking ability test refers to the Competency Standards and Basic of Mathematics Competency for class XI Secondary School. To measure mathematical creative thinking ability students on each question, based on the scoring criteria using the rubric scores from Bosch (Ratnaningsih, 2007).

To find out the SE students towards mathematics is done by self efficacy scales students who conceived and developed with reference to aspects performance experience, the experience of others, aspects of direct support / social, psychological and affective aspects. Item statements SE students towards mathematics consists of 40 items with four answer options are strongly agree (SS), agrees (S), disagree (TS) and strongly disagree (STS). Neutral response option not used to avoid the safe answer and encourage students to perform alignments answers. This instrument was administered to students after the implementation of learning. Before the instrument is used, do empirical test in two stages. The first stage is limited to trials conducted 5

students outside the sample but equal. The purpose of this limited test, for know the readability level of language and simultaneously obtain a description whether the statements of the Self Efficacy scales student of mathematics can well understood by students. From the test results are limited, it turns out indicated that all the statements can be well understood by students, although it remains to be carried out repairs as necessary. After the Self Efficacy scales instrument declared eligible students towards mathematics to be used, then the second stage of trials conducted in class XI students IPA A Secondary School 6 Bengkulu City as many as 38 people. The goal is to find a free trial validity of each item statement as well as to calculate the score of each selection (SS, S, TS STS) of each statement. Thus, scoring every choice of the Self Efficacy scales statement on mathematics students determined a posteriori distribution that is based on respondents' answers or to In other words determine the value scale with a normal deviation (Anwar, 2002). With use this score SS, S, TS and STS of each statement can vary depending on the distribution of student responses.

III. RESULT AND DISCUSSION

Linear regression analysis was used to predict mathematical creative thinking ability of 11th grade students on mathematics self efficacy (n = 211). The independent variable, mathematics self efficacy provided a statistically significant explanation of variance in mathematical creative thinking ability, $R^2 = 0.129$. The regression equation is $Y = 25.543 + 5.091$ (self efficacy).

The basic aim of this study was the exploration of the relationship between self efficacy and their performance in mathematical creative thinking ability. The possibility of self efficacy to predict mathematical creative thinking ability was also examined. The analysis of the data confirm earlier findings that young students have positive self efficacy.

Results of the correlation analysis indicated that mathematics self-efficacy and mathematics achievement were positively related. Students with high mathematics self efficacy were associated with high mathematical creative thinking ability. Additionally,

results of the survey linear regression analysis indicated that mathematical creative thinking ability could be significantly predicted by mathematics self-efficacy. Mathematics self-efficacy was a significantly positive predictor of mathematical creative thinking ability. This finding suggests that students who were confident of their performance in mathematics tended to have better mathematical creative thinking ability. Specifically, students who were confident that they could do an excellent job on mathematics tests, they could understand the most difficult material presented in mathematics texts, they could understand the most difficult material presented by their math teachers, they could do an excellent job on math assignments, and they could master the skills being taught in their mathematics classes, were more likely to have better mathematical creative thinking ability.

Creative thinking is a synthesis between the lateral and vertical thinking complementary. This understanding states that in creative thinking involves both analytical and logical thinking or intuitive, as in The second view in the sense of creative thinking. In solving the problem of the two hemispheres is required. By Sperry (in Edward, 1996) dichotomy of the brain occurs when the gain solving a problem, right brain will be in charge of the situation thoroughly to check the answers obtained. Thus in solving problems will enable the right brain or left. By Therefore in this study, creative thinking is seen as the ability logical thinking and intuitive, following the second view of sense to think creative. To determine a person's ability to think creatively demonstrated through the product of thought or creativity to produce something "new". Munandar (1999) showed indications of creative thinking in its definition that "creativity (creative thinking or divergent thinking) is the ability find many possible answers to a problem, where the emphasis is on quantity, efficiency, and diversity of answers ". This understanding suggests that the more a person's ability to think creatively high, if he is able to show many possible answers to a problem. All answers must be in accordance with the problem and correct. Moreover the answer should vary. Suppose the child is asked to think of use unusual from everyday objects.

Self-efficacy (SE) beliefs constitute a key component in Bandura's social cognitive theory. The construct signifies a person's beliefs, concerning her or his ability to successfully perform a given task or behavior. It was found that SE is a major determinant of the choices that individuals make, the effort they expend, the perseverance they exert in the face of difficulties, and the thought patterns and emotional reactions they experience. Furthermore, SE beliefs play an essential role in achievement motivation, interact with self-regulated learning processes, and mediate academic achievement (Pintrich, 1999).

This study provides empirical evidence of the effect of mathematics self-efficacy on mathematical creative thinking ability among secondary school in Bengkulu. Results from this study can be generalized to the population of approximately ten secondary school in Bengkulu. Compared to the standardized effect of attitude toward mathematics on mathematical creative thinking ability prior research (Ma, 1997; Ma & Kishor, 1997; Ma & Xu, 2004), the effect of mathematics self-efficacy (standardized coefficient = .36) identified in this study was much stronger. This finding suggests that in addition to promote students' attitude toward mathematics it is more important to promote their self efficacy in order to enhance creative thinking in mathematics. Our findings also suggest that efforts are needed for promoting mathematics self efficacy for secondary school students because mathematics self-efficacy was positively associated with mathematical creative thinking ability. Research has indicated that self-efficacy could be increased by using the right instructional strategies (Schunk, 1991; Siegle & McCoach, 2007), such as helping students to set learning goals (Bandura, 1997; Schunk, 1991), providing timely and explicit feedback (Bandura, 1997), encouraging students to study harder (Siegle & McCoach, 2007), and using high achieving students as models (Bandura, 1986; Schunk, 1991; Siegle & McCoach, 2007).

IV. CONCLUSION AND SUGGESTION

The result of the research shows that there is significant effect between self-efficacy which were had by the students toward their creative thinking ability. This

finding suggests that in addition to promote students' attitude toward mathematics it is more important to promote their self efficacy in order to enhance creative thinking in mathematics. Our findings also suggest that efforts are needed for promoting mathematics self efficacy for secondary school students because mathematics self-efficacy was positively associated with mathematical creative thinking ability

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