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Analyze of The Creative Thinking Level of Students Junior High School Viewed From Mathematics Anxiety

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***Abstract*—**This research was a qualitative descriptive research. Creativity is an important aspect to face the global challenges. Creativity is the product of creative thinking. By means of creative thinking, people can create something new and different, and people also can solve the problem with the various of problem solving. Creative thinking is not a talent. It is a skill that can be learnt. It improves people by adding strength to their natural abilities which improves teamwork, productivity and where appropriate profits. Creative thinking is needed for students to develop their thinking system and it is important for supporting them to solve the problem in the real life. Every students has different levels of creative thinking, specifically for mathematics creative thinking. The aim of this research was to analyze the level of creative thinking of junior high school students beside on mathematics anxiety's students. The subjects of this research were taken by using purposive sampling. The subjects of this research were six persons from 9th grade student of SMP N 3 Colomadu Karanganyar regency. The data were collected by questionnaire and task-based interview technique and validated by using time triangulation. Analyze of the data used data reduction, presentation, and conclusion. The result of this research showed: (1) students with high mathematics anxiety had creative thinking level 1 (almost not creative), (2) students with medium mathematics anxiety had creative thinking level 1 (almost not creative) and creative thinking level 2 (quite creative), (3) students with low mathematics anxiety had creative thinking level 2 (quite creative).

Keywords:*creative thinking level, mathematics anxiety.*

I. INTRODUCTION

One of the main purposes in mathematics learning is developing creative thinking skills. Creative thinking skill is an ability to face mathematics problem in order to get its solution. Creative thinking skill is not only to get the solution of the mathematics problems but also for the problem at their real life. Therefore, creative thinking skill has to be developed in mathematics learning. In spite of creative thinking skill is important in mathematics learning, the fact is creative thinking skill have not been given any attention [1]. Sisk in [2] described that mathematics learning was studied commonly by introduce the formula in mathematics and the concept verbally for the students. There is no attention about student's understanding the formula and concept. Developing the logical reasoning, creative and problem solving thinking skills have not noticed yet in mathematics learning. This condition can lead the students off the development of imagination and creativity optimally. It caused the students do not trained for doing intuition, imagining, and trying to solve the problem with various solution.

The research of [3] shows that there are positive influence between creativity and achievement of 11st grade senior high school student. it means if student's creativity was increased, then student's achievement will be increased. In addition, the research of [4] shows the equivalent result, there were positive and signification influence between creativity and achievement of 9th grade junior high school student. Based on two research mentioned, it can be concluded that student's creativity influences student's achievement. If student's achievement is low, then one of the influential elements is student's creativity and it is said that student's creativity is low.

The Percentage from the result of UN 2014/2015 at Karanganyar shows that the test result of plane area material is 56,46%, it is lower than the result of the others material, that is 89,77%. It shows that the student's achievement on plane area material is low, so it means that the student's creativity is low as well. The first survey that have been done by giving mathematics problem solving-task about plane area material and the result, there is different level about student's level of creative thinking, that is level 1 and level 2.

The research from [5] shows that there was various level of student's creative thinking in mathematics problem solving viewed from gender and motivation. As pointed in [5], motivation is an internal condition which can determine behavior and it influences student's problem solving. So, the internal element influences student's level of thinking skill. However, does it influence to the student's level of creative thinking skill. Mathematics anxiety is student's internal factor influences student in problem that problem-solving activity, then it would be researched about various level of creative thinking viewed from mathematics anxiety.

There are many students feel hard to get solution when solving the mathematics problem. Sometime, they also feel not good enough at mathematics learning. That condition can head off the students reach the aim of learning in mathematics learning. One of the problems is mathematics anxiety which felt by students. The anxiety appear as the result from student's experience in mathematics learning. The condition where students feel worried and strained were called as mathematics anxiety.

Mathematics anxiety is a condition that headed off the students to reach learning experience and mathematics assessment [6]. Reference [7] defines the mathematics anxiety as worried and strained feeling and it annoyed the people when facing mathematics not only numeral manipulation but also mathematics problem solving in mathematics learning and the real life. Reference [8] describes the indicator of the students who have mathematic anxiety, that are (a) the students was difficult for doing mathematics, (b) the students avoided mathematics class, (c) the student felt sick, dizzy, afraid, and panic, (d) the student didn't solve the mathematics task. Reference [8] classified four level of mathematics anxiety that were high mathematics anxiety, medium mathematics anxiety, low mathematics anxiety, and no mathematics anxiety. This research used three kind level of mathematics anxiety, that were high level, medium level, and low level of mathematics anxiety

Mathematics anxiety which felt by student would influence their psychic and emotional. Reference [9] describes about mood and emotional were center of thinking process. So, the mathematics anxiety would disturb process of thinking, specifically creative thinking process in mathematics learning and mathematics problem solving. Agree with that, [10] at his research showed that positive emotional determined the better result at three dimension of creativity that was fluency, flexibility, and novelty. It means, the negative emotion caused the negative impact for creativity. The result of Foong as in [11] research concluded that not only mathematics anxiety but also mathematics task anxiety had negative correlation with student's mathematics achievement. Specifically about creativity, Haylock as in [12] describes that the high creativity of mathematics would make student have low level of mathematics anxiety.

Reference [13] has researched about level of student's creative thinking in mathematics problem solving and problem posing. The result was gotten the level of student creative thinking and characteristic of creative thinking stage that is synthesis the idea, building the idea, planning to apply the idea, and applying the different idea on every level of creative thinking. The result of mathematics creative thinking level were level 4 (very creative), level 3(creative), level 2 (quite creative), level 1(almost not creative), and level 0 (not creative).

Edward as in [7] defines that Creative thinking is not a talent, it is a skill that can be learnt. It improves people by adding strength to their natural abilities which improves team work, productivity and where appropriate profits. So, the creativity can be developed based on personality skill. Reference [14] defines that creative was an element of synthetic skill (divergent thinking), analyzed skill (critic and convergent thinking), and practice skill. Reference [15] defines about creativity of mathematics as a thinking abilities divergently and production the number of idea originally.

Level of creative thinking was stage of thinking hierarchical based on the product of mathematics creative thinking that was viewed from aspect of creativity. The aspect of creativity was fluency, flexibility, and novelty. The fluency is indicated when the student fluently produces different ideas which were appropriate to the question task. The flexibility refers production of some ideas which were used to solve a task. The novelty is the main characteristic to assess the product of creative thinking. The three aspect of creativity not only determined on mathematics problem solving, but also on mathematics problem posing. This research used modify of the level of creative thinking which developed by reference [13]. The levels are (1) level 4 (very creative), the subject fulfill the fluency, flexibility, and novelty aspect; level 3(creative), the subject fulfill the fluency and novelty aspect; level 2 (quite creative), the subject fulfill the fluency and flexibility aspect; level 1(almost not creative) the subject fulfill the fluency aspect, and level 0 (not creative), the subject doesn't fulfill any aspect of mathematics creative thinking.

Based on that description, there are relationship between level of creativity and level of mathematics anxiety. The level of creative thinking is the level of creativity for doing and getting solution in mathematics problem solving. The level of mathematics anxiety shows the level of student's anxiety when facing the mathematics learning and mathematics problem solving. In this research, the level of creative thinking use five classification as modify from reference [13] and the aspects of creative thinking are fluency, flexibility, and novelty. In this research, the indicator and level of mathematics anxiety use three classification, that are high level, moderate level and low level of mathematics anxiety. So, the aim of this research is to analyze how do the level of creative thinking on mathematics problem solving viewed from mathematics anxiety.

II. METHOD

The research approach was qualitative research which aim to identify the level of student's creative thinking viewed from student's mathematics anxiety. The method for determining a sample subject used purposive sampling. The subjects of this research were six persons from 9th grade student of SMP N 3 Colomadu Karanganyar regency. At the first time, students were given questionnair of mathematics anxiety. From the result of this questionnair, students were classified based on the level of mathematics anxiety. The level of mathematics anxiety are high mathematics anxiety, moderate mathematics anxiety, low mathematics anxiety, and no mathematics anxiety. Subjects of this research were selected from high level, medium level, and low level of mathematics anxiety. Finally, the subjects were six students and they are two students have high mathematics anxiety, two students have medium mathematics anxiety, and two students have low mathematics anxiety.

The data were collected through questionnaire and the task-based interview to the 9th grade students on junior secondary school. The main instrument at this research was the researcher. The secondary instrument at this research were (1) the questionnair of mathematics anxiety, (2) the task of problem solving, and (3) the guide of interview. The questionnaire of mathematics anxiety was used to get information about student's mathematics anxiety and the result was used to determine the subjects of this research. The problem solving task was used to identify the level of creative thinking students. The task was an open-ended task.

Triangulation was conducted by giving another equivalent task for students and interviewing them again deeply. The student's work was analyzed by identifying the correctness of the answer, then checking for aspects of creative thinking (fluency, flexibility, and novelty) in problem solving. Analyze of the data used data reduction, presentation, and conclusion.

III. RESULT AND DISCUSSION

A. Result

The results of this research were (1) the student, who had high mathematic anxiety, got level 1 (almost not creative) of creative thinking, (2) the students, who had moderate mathematic anxiety, got level 1 (almost not creative) and level 2 (quite creative) of creative thinking, and (3) the student, who had high mathematic anxiety, got level 2 (quite creative) of creative thinking.

B. Discussion

The result of this research described the level of creative thinking students based on their level of mathematics anxiety. The subject who had high mathematic anxiety could solve the problem correctly and they solved the problem by the proper algorithm. They could not give another solution for the problem. They didn't have any interest for solving the problem by other method. So, the subject who has high mathematics anxiety just filled the fluency aspect. Based on the level of creative thinking, the subject that just filled the fluency aspect had the level 1 (almost not creative) of creative thinking.

Two students who have moderate mathematics anxiety had the different result. One of the student could solve the problem correctly and he solved the problem by the proper algorithm. He could not give another solution for the problem. The other student could solve the problem correctly and he could solved the problem with other solution. So, the first student just filled the fluency aspect and the others could fill fluency and flexibility aspect. Based on the level of creative thinking, the subject that just fulfilled the fluency aspect had the level 1 (almost not creative) and the subject that fulfilled the fluency and flexibility aspect have the level 2 (quite creative).

The subjects who had low mathematics anxiety could solve the problem correctly and they could solved the problem with other solution. So, they could fulfill fluency and flexibility aspect. Based on the level of creative thinking, the subject that fulfilled the fluency and flexibility aspect had the level 2 (quite creative) of creative thinking. Based on field note, the subject who had low level of mathematics anxiety did not look stressed when doing mathematics problem. At the first time, subject did not feel confident when asked to do mathematics problem. The subject was afraid if the problem was difficult and he could not solve the problem. But the subject felt more confident than before when he was reading and understanding the problem. It showed that the subject felt anxiety when first facing mathematics problem, because the subject prejudiced that the problem would be so difficult for him. This anxiety was low level of mathematics anxiety. As in [16], the people who had low level of mathematics anxiety would feel unconfident and afraid, sometime there were physical indication, like tremble. Agree with that, [17] described that people who had mathematics anxiety was strained and anxious, but that feeling would come infrequently for the people who had low level of mathematics anxiety. So, the subject who had low level of mathematics anxiety could solve the mathematics problem properly, but when they met the difficult one, they thought to give up with the problem.

The result of this research was supporting the other research which the conclusion of its research was the student who had low level of mathematics anxiety have the better achievement than the student who had high and moderate level of mathematics anxiety. The low level of mathematics anxiety was brought positive influence for student on mathematics problem solving and their mathematics achievement. The subject who had low level of mathematics anxiety well did every stage of creative thinking process on mathematics problem solving at circle material. The subject through every stage of creative thinking process that is preparation, incubation, illumination, and verification. The subject who had low level of mathematics anxiety also fulfilled the fluency and flexibility aspect of creative thinking. By the creative thinking like that, the student's achievement would be better than the subject who had high and moderate level of mathematics anxiety. The result of this research, the subject who had low mathematics anxiety had level 2 (quite creative) of creative thinking and the subject who had high level of

mathematics anxiety had level 1 (almost not creative) of creative thinking. It means the level of subject who had low level of mathematics anxiety higher than subject who had high level of mathematics anxiety.

IV. CONCLUSION

The conclusion of this research were: (1) the student who have low level of mathematics anxiety had level 2 of creative thinking (quite creative), (2) the student who have moderate level of mathematics anxiety had level 2 of creative thinking (quite cre ative) and level 1 of creative thinking (almost not creative), (3) the student who have high level of mathematics anxiety had level 1 of creative thinking (almost not creative).

The suggestion based on this research were: (1) teacher can give open ended and challenge problem, and ask the student to solve the problem with various solution, so the student will be trained to increase their creativity on mathematics problem solving; (2) teacher should give motivation for student, especially student who have high level of mathematics anxiety, because the student feels afraid for facing the mathematics and hard mathematics problem, and the teacher can contiguous the student who have moderate and low level of mathematics anxiety and give the problem as high as their skill; (3) the student who have mathematics anxiety should do cleverly the mathematics problem which easier, then the student will habitual about mathematics problem and the student can understand in mathematics learning step by step; (4) the result of this research can be reference for another researcher for developing the model of learning which increasing student's creativity and decreasing student's mathematics anxiety.

REFERENCES

[1] Siswono, T. Y. E., "Mendorong Berpikir Kreatif Siswa Melalui Pengajuan Masalah (Problem Possing)," Konferensi Nasional Matematika XI, Universitas Udayana Denpasar, 2004. in press.

[2] Munandar, S.C. Utami, Kreativitas & Keberbakatan. Strategi Mewujudkan potensi kreatif & Bakat. Jakarta: PT Gramedia Pustaka Utama, 1999.

[3] Rachmawati, L., "Pengaruh Kreativitas Siswa terhadap Prestasi Belajar Kelas XI IPS SMA N 1 JALANCAGAK Subang," Tesis. Bandung: Universitas Pasundan, 2012. unpublished.

[4] Sagitasari, D., "Hubungan Antara Kreativitas dan Gaya Belajar dengan Prestasi Belajar Matematika Siswa SMP," Tesis. Yogyakarta: UNY, 2010. unpublished.

[5] Sunarya, L., "Profil Tingkat berpikir kreatif siswa kelas VII SMP N 16 Surakarta dalam Pemecahan Masalah Materi Aritmatika Sosial ditinjau dari Motivasi dan Gender,"Tesis. Surakarta: Universitas Sebelas Maret., 2013. unpublished.

[6] Haylock, D & Thangata, F., Key concepts in teaching primary mathematics. London. SAGE Publications. Ltd, 2007.

[7] Johnson, C., "Attitude or Anxiety: Mathematics Disposition of High School Algebra Students," Thesis. Wichita State University, 2006. unpublished.

[8] Paul, M., Exploring Mathematics Anxiety: Mathematics Students' Experiences. Mediterranean Journal of Social Sciences Vol 5 No 1 January 2014. Rome-Italy: MCSER Publishing, 2014, pp. 283-294

[9] Newton, D. P. Moods, emotions and creative thinking: A framework for teaching. Journal.*Elsevier: Thinking Skills and Creativity8 (2013)*, 2013, pp. 34– 44.

[10] Vulpe, A and Dinaofiiun, D. Positive emotions's influence on attitude toward change, creativethinking and their relationship with irrational thinking in Romanianadolescents.Journal. *Procedia - Social and behavioral Sciences 30 (2011)*, 2011, pp. 1935 – 1941.

[11] Keow, L., Mathematics Anxiety in Secondary School Students.Journal.Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia. Singapore: MERGA, 2012.

[12] Fetterly, J. M. "An Exploratory Study of The Use of a Problem-Posing Approach on Pre-service Elementary Education Teachers' Mathematical Creativity and Mathematics anxiety," Disertasi. College of Education The Florida State University, 2010. unpublished.

[13] Siswono, T. Y. E., "Perjenjangan Kemammpuan Berpikir Kreatif dan Identifikasi Tahap Berpikir Kreatif Siswa dalam Memecahkan dan Mengajukan Masalah Matematika," Disertasi. Surabaya: Universitas Negeri Surabaya, 2007. unpublished.

[14] Sternberg, R.J. The nature of creativity.*Creativity Research Journal*, 18, 2006, pp. 87-98.

[15] Johny, S. Effect of some environmental factors on mathematical creativity of secondary school students of Kerla (India). *Proceedings of the 11th Congress on Mathematical Education*, Monterrey, Mexico, 2008.

[16] Cavanagh, Measuring Mathematics Anxiety: Developing A Construct Model. *Journal of Curtin University*. Paper Code: 2062, 2010.

[17] Supratiknya, Mengenal Perilaku Abnormal. Yogyakarta. Kanisius, 1995.