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The profile of student's creative thinking skills in mathematics problem solving in terms of adversity quotient

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Abstract. The objective of this study is to describe students' creative thinking skills in terms of Adversity Quotient. Students of tenth grade math and science studies were given an AQ questionnaire to find out their personality types. Three students from each personality type of quitters, campers, and climbers were given tests to find out their creative thinking skills. The procedure of this study refers to the qualitative content analysis method: (1) giving questionnaires and tests, (2) presenting in detail about students' mathematical performance, and (3) in-depth interviews. It was known from 97 subjects who were given questionnaire, 6 students are quitters, 2 peoples switched from quitters to campers, 48 campers, 36 campers to climbers and 5 climbers. Three quitters and campers didn't fulfill with creative skill qualifications. Whereas for the climbers' showed fluency and flexibility.

1. Introduction

In this modern era, creativity is absolutely needed in committing the need of globalization challenges. Creativity taken from the base word 'create', it means 'to make'. Teaching and learning process is one of the attempts to promote and develop creativity within the educational instructions. This process is closely having relationship to daily activities with the objectives of education. In education, the teaching and learning process is one of the efforts to train and develop it. Creative thinking skills can be analyzed when students are in the problem solving process. The indication is when students are able to provide alternative answers and varied strategies, the uniqueness of the solutions offered as well as the detail of the answers presented.

The ability and problem solving process of each student is different, according to the characteristics of each. The ability of a person to change the problem he faces into a challenge that must be solved as well as possible is called Adversity Quotient (AQ). Stoltz (2010) states that AQ is someone's perseverance in facing obstacles to achieving success. There are three personality types in AQ: quitter, camper, and climber. A quitter will give up easily in facing of problems. While the camper is willing to accept the challenges they face, even if they don't reach the top and tend to be easily satisfied with the achievements. Climber type people are always eager to reach the peak of success, do not easily give up and despair, are ready to face challenges, and are always oriented to self-success.

2. Major Heading

Santrock (2010) states creativity is the ability of thinking on the matter with the recent method and particular way to gain unique solutions. Whereas Siswono (2008) states creative thinking might be regarded as a mental activity to construct the fresh idea and opinion. Creative thinking includes; (a)



fluency, students' ability in gaining the solution on the proper way. (b) flexibility; the ability of being able to answer the problems with different responses, and (c) novelty; the ability to present any kind of responses base on the acceptable and particular ways in accordance with their level of knowledge. Creative thinking is a process applied to promote recent ideas. Creativity is the product of thinking. Creative thinking might also be assumed as a combination of logical and divergent thinking process base on the intuition within the frame of awareness (Pehkonen, 1997). Further, creative thinking in mathematics might also need flexibility, fluency, and novelty (Pehkonen, 1999).

It is not merely creativity, problem solving might also become the objective learning of schools mathematics. The problem in mathematics defined as condition or situation that ought to be solved by the students without any other routine procedure. Creative thinking can be analyzed when students are in the process of problem solving. The indicator is that the students are able to present different alternative in problem solving base on the different strategy. Problem solving is also able to be applied to identify creative thinking skills (Silver, 1997). Creative is multi-constructions involving convergent and divergent thinking process, the willingness of expressing the questions and self-confidence (Mann, 20016).

Polya (1973) defines problem solving as the efforts to find the solution of the difficulties, reach the objectives through the logical attempts. In mathematics problem solving, students have to comprehend not only the process of overcoming the problem but also the skill in choosing, identifying the condition and concept needed, searching the generalization, formulating the plan and organizing the skills aimed into problem solving acts. Namely; (a) comprehend the problem items in terms identifying which one is understood or not understood; (b) set the plan, finding the relationship among the data, identifying the related items, (c) execute the plan by applying the knowledge and personal experience to deal with all the items, and (d) review to evaluate whether the answers are correct or not. Searching the alternative answers and strives to get other strategy to apply with.

Problem solving needs the process of creation, develop and relate the ideas and thought. Consequently, teachers should accommodate with students' answer when they convey the ideas and thought. Such a puzzle items may be able to be used to develop imagination skill and creativity (Krulik and Rudnick, 1989). Open-ended items have the characteristic of giving chance to the subjects to expose the skills of creative thinking and present diverge and alternative solutions. Either open-ended items or learning materials obviously indicate to enhance students' creative thinking skill (Noer, 2011).

A student might easily overcome the problems as he/she has an adequate ability to solve the problems. An ability could changed the problems into challenge that need to be solved as Adversity Quotient (AQ). Stoltz (2015) states AQ is the perseverance in facing the obstacles to gain success. AQ ideally enlighten the firm motivation in which one is able to cope the problem that lead to gain the success. There are three characteristic in AQ; quitter, camper and climber. A quitter is easily to give up in facing the problems equal to the climber that easily come to desperation, tends to be inactive and has no passion to reach the peak of success. A camper tends to satisfy upon what he/she has already gained though he/she never reach the peak, however; they do not resist against the challenge. A climber is constantly in high spirit to gain the success, stiff, and has self-oriented to reach the success. AQ has either direct or indirect good influence into students' creative thinking skills. Hidayat (2017) indicates that AQ has strong influence to creative mathematical ability of the students enrichment.

Research held by Setyabudi (2011) on the relationship of creativity and intelligence with AQ come to conclusion that there is positive significant correlation between creativity and AQ. He states that better students ability to respond leads to the better creativity. Furthermore, a research held by Suhandoyo and Wijayanti (2016) indicates the higher students AQ tends to have more components to construct a creative thinking. Derive from the subjects of the research, three students in which each as a climber, a camper, and a quitter. The climber fulfill with the components of fluency and flexibility, meanwhile the camper and quitter of each has only fluency.

3. Methodology

The subject of the research is the students of tenth grade students of Mathematics and Science Studies of State Senior High School. It was qualitative approach in descriptive research. The data accumulated on the method of test, questionnaire, and interview. The research data analyzed qualitatively. The research begun by distributing the questionnaire for 97 students to identify the type of AQ. The results of this questionnaire were analyzed and each of the three students was chosen to represent each of AQ's personality types to become subjects of research. Three students elected as the research subjects of each type; quitters, campers and climbers. Next, a creative thinking skills test was conducted on the subject. Test conducted to recognize the creative thinking skills of the subjects.

4. Results and Discussion

Based on the research conducted on 97 students, the results indicate; 6 students are considered as quitters, 2 students identified as quitters shifted into campers, 48 students as campers, 36 students as campers shifted into climbers and 5 students significantly as climbers.

Three subjects considered as quitters and campers do not fulfill with the creative skill components, meanwhile; for those climbers personality indicating creative thinking skills and flexibility. The failure of the subjects in revealing creative thinking skills due to less scrupulous in doing the operations of figures, lack of comprehension upon linear equation system of three variables lesson material, the limited duration and attitude which lead to give up while facing the difficulties of doing the items.

The analysis upon the results presented by 9 subjects of the research indicate that few of them are unable to fulfill with the qualifications of creative thinking skills include the fluency, flexibility and novelty. Those considered as the climbers are regarded committed the components of fluency and flexibility. in which other subjects do not fulfill with the qualifications.

For item no. 1, those three subjects as climbers are able to answer correctly while other subjects have incorrect answer for the same items. Many factors are considered the cause of incorrect solution on these items. linear equation system of three variables items with fractional variable frequently thought as difficulties. This items supposed to be solved by other equal strategy by applying analogical other variable. The usage of new variable; hence, the equation item is simpler, thus it is easier to be accomplished. In fact most of the research subjects still write incorrect equation of this new variable. For the item no.2, all of the subjects have done it correctly. This item thought as relatively easy for the subjects are able to use either substitution method or the combination elimination and substitution method. Still there is a slight lack of presenting the solution of the last item, is that; the subjects do not enclose the measurements of an equilateral triangle as the former items apply "centimetre" measurement. The researcher has not identified other method used by the subjects, namely; determinant method or others. The subjects tend to reveal the similar accomplishment.

Few of the research subjects are able to accomplish the third item properly. They complain on the usage of elimination method for the new equation gained indicating "zero". The similar result also happened when they use determinant method. Determinan that has already calculated also lead to "zero". Consequently, they think that this item is difficult to solve. However, some subjects still in effort to solve this item even they face the difficulty. Supported by the instruction given by the researcher they are able to comprehend that the value of the variable has interrelated of one another and has many alternative answers. Due to limited time, the subjects merely present a single type of solution on this item.

There are many factors that lead to mistakes in dealing with this item. Generally, the subjects are less conscientious in figures operation. Most of the subjects face the difficulties in solving the item no.3, when they find that either elimination or determinant has a zero value, they have no ideas what should they do. They said that they never had dealt with such an item of this kind. They said that linear equation system of three variables lesson material of this semester has never been discussed on plural solution. Some climbers still do the efforts of doing this item supported by few instruction of the

researcher they are able to solve the equation item as it is instructed. Base on the observation and analysis, the three kind of subjects indicate the difference of each kind. The quitter had done some mistakes for they argue that this lesson material was presented in the former semester, consequently; they all forgot to find the proper solution upon those items. The campers indicate the better spirit in solving such kind of items by asking the researcher on this matter and held a review on the similar items. In accordance with Stoltz (2015) that AQ distinguish climbers from campers and quitter when these types of personality has to deal with problem solving on particular matter, difficulties, challenges, and obstacles. When the circumstances grows harder, the quitters tend to give up while the campers still to seek the efforts of proper solution, the climbers constantly still hike to reach the peak.

The result of the research is in accordance with the research conducted by Setyabudi (2011) on the relationship between creativity and intelligence in conjunction with AQ. from the Subject of the research ; SMA (Senior High School) students in Surabaya, concluded that there is a significant correlation between creativity and AQ. The better respond of the students either the ability of being sustain in such condition the better the ability of handling the solution and it promote the better creativity. The climbers subjects prove that this kind of subject fulfill with the qualifications of being a creative thinking as it is observed by Suhandoyo and Wijayanti (2016) in their research. The higher the students' AQ, they tend to fulfill all the components needed in a creative thinking. The climbers have stiff personality in problem solving better than the other types of personality, they are; the campers and the quitters. The subjects with higher AQ reveal the better spirit in struggling against the problems that lead to a better creative thinking skills.

5. Conclusion

The analysis reveals that three students of each of the 'quitters' and 'campers' personality do not fulfill the qualifications of creative thinking skills, while 'the climbers' prove to reveal a creative thinking skills both of fluency and flexibility. There are some factors cause the failure of the subjects, is that less conscientious in accomplishing the figure operation, neither do comprehend the linear equation system of three variables lesson material. The limited duration and desperation are also contribute to the failure of these kind of subjects.

In dealing with the lack of students ability in solving the mathematics items, it is recommended the teachers to facilitate the students get used to deal with mathematical items solution, identify the students' personality in constructing teaching learning activities in the classroom; and drive the students to a creative thinking by presenting the mathematical items that need such kind of open and divergent solution as well. AQ is a person's personality type is facing obstacles in his life. This personality also allows for influence in student learning styles. therefore, research can be developed in other domains, namely to find out whether there is the influence of AQ in student learning styles, especially in mathematics learning.

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References

- [1] Hidayat W Adversity quotient and mathematical creative reasoning in high school students in learning argument driven inquiry on material derived functions *KALAMATIKA: Journal of Mathematics Education* **2** (1) pp. 15-28
- [2] Krulik S and Rudnick J A 1989 Problem Solving: A Handbook for Senior High School Teachers *Allyn & Bacon/Logwood Division, 160 Gould Street, Needham Heights, MA* 02194-2310
- [3] Mann E L 2006 Creativity: The essence of mathematics *Journal for the Education of the Gifted* **30** (2) pp.236-260
- [4] Noer S.H 2011 Mathematical creative thinking skills and Open-Ended problem-based mathematics learning *Journal of Mathematics Education* **5** (1).

- [5] Pehkonen E 1992 Using Problem-Field as a Method of Change *Mathematics Education* **3** (1) pp 3-6
- [6] Pehkonen, E 1997 The State-of-Art in Mathematical Creativity **29** (1)
- [7] Polya, G 1973 How to Solve It *International handbook of mathematics education, London: Princeton University Press*
- [8] Sari, C K, Sutopo, Aryuna, D R 2016 The Profile of Students' Thinking in Solving Mathematics Problems Based on Adversity Quotient *Journal of Research and Advances in Mathematics Education* **1** (1)
- [9] Santrock and John W 2008 Psychology of education Edition 2 *Jakarta: Kencana Prenada Media Group*
- [10] Setyabudi, Iman 2011 The relationship between adversity and intelligence with creativity *Journal of Psychology* **9** (1)
- [11] Silver, E.A 1997 Fostering Creativity through Instruction Rich in Mathematical Problem Solving and Problem Posing *The International Journal on Mathematics Education* **29** (3)
- [12] Siswono T Y E 2007 Design assignments to identify students' creative thinking abilities in mathematics
- [13] Siswono T Y E 2008 The creative thinking process of students in solving and submitting mathematical problems *Journal of Educational Sciences* **15** (1) p. 60-68
- [14] Stoltz P G 1997 Adversity quotient: Turning obstacles into opportunities *John Wiley & Sons*
- [15] Suhandoyo and Wijayant 2016 Profile of students' creative thinking ability in completing higher order thinking questions in terms of adversity quotient (AQ) *Mathedunesa, Jurnal Ilmiah Pendidikan Matematika* **3** (5)