The Perception of Junior High School Students in Sleman on Mathematics and Creativity

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Abstract. This research is a descriptive-qualitative research which aims to describe the students’ perception on mathematics and creativity. The research subjects were 32 students in one of junior high school in Sleman with low mathematical ability based on their National Exam in mathematics in 2017. Samples were selected through cluster random sampling technique. Data were collected through questionnaires which consisted of six semi-open questions and two open questions. Through semi-open questions, students were given some statements that is available to choose more than one options. Moreover, students were allowed to write their own statement related to the questions. The result indicates that 62.5% of the students have realized the importance of mathematics but 65.625% referred that mathematics lessons are difficult to understand and 81.25% of the students want mathematics class end as soon as possible. While 57.81% of the students have understood the definition of creativity but 71.875% did not realize that the completion of mathematics problems can be done through many ways and only 12.5% of the students answering mathematics question through various ways. This is indicated that the students have less positive perception on mathematics and have perception that creativity not have relation with mathematics.

1. Introduction
Considering the importance of mathematics then it becomes important to improve students’ engagement in mathematics. Students’ engagement influences their willingness to participate actively in various mathematical assignments, enjoying and realizing the correlation between mathematics and their own lives [1]. The purpose of learning is not just about delivering the lesson, but also the students must be actively engaged and pleasant in knowledge building until they achieve positive academic result [2]. Students’ engagement level in the class is influenced by their perception [3]. Negative attitude towards mathematics that difficult to change influenced the low engagement level in mathematics experienced by the students [1]. Some students see mathematics class has no correlation to their daily life and probably has no correlation to other academic fields [4]. Many studies investigate students’ less engagement in mathematics however few of them explores students’ perception on mathematics itself especially for the students who right now have low engagement level.

Students’ low engagement level is also influenced by their awareness towards their mindset development. Many students don’t see mathematics as the foundation of mindset development. One of them is developing creativity in mathematics. Creativity is a very important element to succeed in mathematics [5]. Creativity is also considered as on of the biggest asset of a nation that has important
role in the cycles of the sustainability of mathematics thought [6]. Therefore, mathematics creativity is a skill that has to be improved by all students as future citizens in order to be able to overcome the challenge in the future efficiently [5, 7, 8].

Considering the importance of creativity in mathematics, there have been many researches conducted to investigate the correlation between mathematics ability and mathematics creativity [9]. Mathematics creativity can predict mathematics ability [10, 5]. Another research have also revealed that mathematical creativity is significantly related to problem solving skill [11], mathematics ability [12, 5, 13], and attitude towards mathematics [14]. This significant relation causes students with the highest mathematical abilities are the most creative students and students with an average score in a math test have an average level of creativity and students with low math scores also have a low level of creativity [5]. However, different result is revealed by another research. Mathematical intelligence is affected by mathematical creativity and vice versa but there is no significant direct causal relationship between mathematical intelligence and mathematical creativity.

Students’ low engagement is also influenced by their point of view and knowledge towards creativity itself. The improvement of mathematical knowledge influence the level of mathematical creativity [14]. Thus, one way to investigate the inhibition of students’ creativity development is by exploring their perception, particularly among a group students’ perception with low mathematical ability. Their opinion should be discovered in order to inform the framework which supports high quality teaching and learning process. Knowing the perception of students will assist teachers to design the learning environment which make students feel less afraid of failure and keep comfortable to learn and more advanced [15]. Therefore, this research aims to describe perception of students with low mathematical ability on mathematics and creativity, also the correlation between them.

2. Research Methods
This research is a descriptive-qualitative research which aims to describe students’ perception on mathematics and creativity. The subjects were 32 students in one of junior high school in Sleman with low mathematical ability. Samples were selected through cluster random sampling technique. The sampling process begins with collecting data from the result of National Examination 2016/2017 in mathematics in order to classify the rank of junior high schools in Sleman. School placed in bottom rank were selected to be sample groups.

The data were collected through questionnaires consisted of six semi-open questions and two open questions. As the main instrument of the research, item in questionnaires were fulfilled the validity of content. This questionnaires consists of two parts namely the perception towards mathematics and mathematics learning and the perception towards creativity. Students’ perceptions are explored to confirming knowledge, attitudes, experience, and expectations towards mathematics learning and creativity. In addition, it is possible to make comparisons and relationships between them.

Through semi-open questions, students were given some statements that is available to choose. There were no limitation of how many statements the student may choose, as long as the statements does fits their perception. Moreover, students were allowed to write their own statement related to the questions. There are 28 statements from 6 semi-open questions, all of them were assessed using Guttman scale to gain the firm result. Students are required to respond to statements by selecting statements they agree upon and not selecting to statements that they disagree. The questionnaire used as listed in Table 1 below.

| Questions | Statements                                                                 |
|-----------|-----------------------------------------------------------------------------|
| 1. How do you see mathematics? | Mathematics is the science that only consists of formulas                      |
|           | Mathematics lessons are difficults to understand                               |
|           | Mathematics problems are difficult to overcome                                |
|           | The completion of mathematics problems can be done through various ways       |
|           | Mathematics has no correlation to other sciences                              |
Mathematics is beneficial for daily life  
Mathematics develops students mindset  
(Write your opinion)…

| 2. How is your attitude in learning mathematics? | I’m happy when I learn mathematics  
I want additional hour when I learn mathematics  
I do not like learning mathematics  
I want mathematics class end as soon as possible  
(Write your opinion)… |
|---|---|

| 3. How do you comprehend mathematics lessons? | I memorize the existing formulas  
I understand the mathematics formulas meaningfully by comprehending how the formula was obtained  
I feel difficult when faced to mathematics problems that differ from the example which given by the teacher  
(Write your opinion)… |
|---|---|

| 4. How do you expect mathematics learning? | Creativity is someone’s skill in thinking about something unthinkable by other people  
Creativity is someone’s skill in creating something new and different  
Creativity is someone’s skill in overcoming problems through many ways  
Creativity is someone’s skill in easing something difficult  
Creativity is someone’s skill in making details of a problem or object by using various precise representation  
(Write your opinion)… |
|---|---|

| 5. What is the creativity? | Mathematics needs creativity  
Students who have high mathematical ability means they have high creativity  
Students who have high mathematical ability does not mean they have high creativity  
Students who have high creativity means they have high mathematical ability  
Students who have high creativity does not mean they have high mathematical ability  
(Write your opinion)… |
|---|---|

| 6. What is your point of view towards creativity and mathematics? | I like answering mathematics question by trial and error  
I like answering mathematics question by following the steps that explained by the teacher  
I like answering mathematics question through various ways  
I like check and recheck the results of my answer on mathematics question  
(Write your opinion)… |
|---|---|

| 7. How do you overcome mathematical problems? | Students who have high mathematical ability means they have high creativity  
Students who have high mathematical ability does not mean they have high creativity  
Students who have high creativity means they have high mathematical ability  
Students who have high creativity does not mean they have high mathematical ability  
(Write your opinion)… |
|---|---|

The method used to analyze the data is started by preparing and organizing data, then reducing data, and presenting data in the form of table and or discussion [16]. To support the reliability of the data, triangulation was employed through checking data obtained from teachers and achievement of the students in mathematics obtained from the mathematics teacher who teaches in this class. The answers, especially the strong and outstanding outcomes of the negative or positive perceptions, were checked and confirmed by mathematics teacher. Confirmation from the teacher could be in the form of the involvement and achievement of their mathematics.

3. Results and discussion
Students’ Perception Towards Mathematics Learning
**Question 1: How do you see mathematics?**

Table 2. The Percentage of Students’ Answer to Question 1.

| Statements                                                        | The Percentage |
|------------------------------------------------------------------|----------------|
| Mathematics is the science that only consists of formulas         | 21.875%        |
| Mathematics lessons are difficult to understand                   | 65.625%        |
| Mathematics problems are difficult to overcome                    | 37.5%          |
| The completion of mathematics problems can be done through various ways | 28.125%        |
| Mathematics has no correlation to other sciences                  | 0%             |
| Mathematics is beneficial for daily life                          | 62.5%          |
| Mathematics develops students mindset                              | 37.5%          |

Based on the Table 2, it can be seen that generally the students have seen mathematics beneficial for their daily life. In line with that point of view, the students also realized that mathematics has correlation to other sciences. This showed that students have realized the importance of mathematics. However, 65.625% found that mathematics lessons are difficult to understand. While 71.875% also did not realize that the completion of mathematics problems can be done through many ways. This perception inhibits imagination, curiosity, and their experiments [5].

In addition to the above statement, some students added their point of view towards mathematics. From 6 students who answered the questionnaire, 2 of them wrote that mathematics is boring, two other students wrote that mathematics is fun, 1 student wrote mathematics is important, and 1 other added that mathematics teacher is a killer teacher. The students’ answer was connected to their achievement in mathematics. The result indicated that the students who found mathematics boring were the students with low mathematical ability in class. Otherwise, the students who found mathematics important and mathematics fun were the students who had good at mathematics in class.

**Question 2: How is your attitude in learning mathematics?**

Table 3. The Percentage of Students Answers to Question 2.

| Statements                                                        | The Percentage |
|------------------------------------------------------------------|----------------|
| I’m happy when I learn mathematics                                | 21.875%        |
| I want additional hour when I learn mathematics                   | 3.125%         |
| I do not like learning mathematics                                | 28.125%        |
| I want mathematics class end as soon as possible                  | 81.25%         |

The Table 3 showed that students’ attitude in learning mathematics dominated by students who want mathematics lesson end as soon as possible. This reflected that the students in general do not have good engagement in mathematics. This is supported by the second biggest percentage which is that students do not like learning mathematics. Students’ low interest in learning showed that the students in general still do not find mathematics as something fun and interesting [17].

Some students also added statements like attitudes in learning mathematics. From 7 students who added, 3 of them wrote; I want there is game in learning mathematics, 2 students wanted more explanation when learning mathematics and they wanted the teacher to pay more attention to students’ understanding, 1 student wanted the mathematics teacher to be not killer, and 1 other expected there is no additional lesson in mathematics.

**Question 3: How do you comprehend mathematics lessons?**

Table 4. The Percentage of Students Answers to Question 3.

| Statements                                                        | The Percentage |
|------------------------------------------------------------------|----------------|
| I memorize the existing formulas                                 | 34.375%        |
I understand the mathematics formulas meaningfully by comprehending how the formula was obtained  25%
I feel difficult when faced to mathematics problems that differ from the example which given by the teacher  71.875%

The Table 4 above indicated that the students dominantly feel difficult when faced to different mathematics problems from the example given by their teacher. This might be caused by students’ habit in comprehending mathematics lessons by memorizing the formulas not by understanding mathematics lesson meaningfully until their memory did not last for a long time. Then the assignment focuses on memorization must be avoided in order to enable the students to develop their creativity [7].

One of the students added the way to understand mathematics lesson by doing some exercises provided in the books and students’ worksheet book. After checked, the students who wrote this statement was the students who had good at mathematics.

*Question 4: How do you expect mathematics learning?*

The fourth question, the student was given an open question related to mathematics learning which they expect. Some answers appear. The students’ answers were segmented, reduced, and organized until dominantly produce data as written in the table below.

**Table 5.** Students Answers to Question 4.

| Students Answers                                                                 |
|----------------------------------------------------------------------------------|
| I expect the teacher explains slowly, orderly, and in details.                    |
| I expect fun mathematics learning by inserting game in it                         |
| I expect a friendly mathematics teacher                                          |
| I expect relaxed situation in mathematics learning                               |
| I expect there are opportunities to study mathematics outside the class           |
| I expect rarely exam in mathematics                                               |
| I expect the teacher gives explanation before giving the exercises to the students|

The most dominant answer written by the students was the teacher explains slowly, orderly, and in details. Then followed by expectation mathematics learning has game in it and friendly mathematics teacher. Beside the answers above, there were students who expected the number of assignments not too many, the teacher gives explanation before giving the task, the mathematics problems not different from the examples explained by the teacher, no punishment to the students who did not do the task, and they can answer mathematics questions in groups.

The teacher is the strongest influence on students’ engagement in mathematics. Students’ answer related to expected learning process has firm correlation to teachers’ roles [1].

Based on the result above, it can be seen that in general the students still expect teacher centered learning. Students were not considering teacher as a facilitator and learning partner [7]. They tend to avoid challenges and see mathematics problems as burden. Their view are basically wrong because a challenging problem is actually propelling mindset development and students’ skill [8]. Only two students who expected student centered learning in the form of group discussion in order to build their own knowledge. Those two students are students with good at mathematics based on their achievement.

**Students’ Perception Towards Creativity**

*Question 5: What is the creativity?*

Mathematics creativity is a subcomponent of mathematics skill in the form of the ability in presenting data in various representation, comparing solution strategies, connecting some concepts and ideas, and
seeing mathematics content from different perspectives [4]. Creativity is different thought and measured in many effectivity, flexibility, and originality of ideas produced [7, 8].

**Table 6.** The Percentage of Students’ Answer to Question 5.

| Statements                                                                 | The Percentage |
|----------------------------------------------------------------------------|-----------------|
| Creativity is someone’s skill in thinking about something unthinkable by other people | 43.75%          |
| Creativity is someone’s skill in creating something new and different       | 68.75%          |
| Creativity is someone’s skill in overcoming problems through many ways      | 46.875%         |
| Creativity is someone’s skill in easing something difficult                 | 18.75%          |
| Creativity is someone’s skill in making details of a problem or object by using various precise representation | 15.625%         |

From the Table 6 above, it can be seen that generally the students have understood the definition of creativity. 68.75% students saw creativity as someone’s skill in creating something new and different. Then followed by 46,875% found creativity as someone’s skill in overcoming a problem through many ways and 43,75% understood creativity as someone’s skill in thinking about something unthinkable by other people. Therefore, it can be concluded that most of the students have good understanding towards creativity.

Beside the statements above, three students also wrote other point of view on creativity, such as creativity is a master piece of art, creativity is the skill produced by imagination and producing uniqueness, and creativity is a skill to create newly easy formula to be memorized.

**Question 6: What is your point of view towards creativity and mathematics?**

**Table 7.** The Percentage of Students’ Answers to Question 6.

| Statements                                                                 | The Percentage |
|----------------------------------------------------------------------------|-----------------|
| Mathematics needs creativity                                               | 34.37%          |
| Students who have high mathematical ability means they have high creativity | 15.625%         |
| Students who have high mathematical ability does not mean they have high creativity | 40.625%         |
| Students who have high creativity means they have high mathematical ability | 18.75%          |
| Students who have high creativity does not mean they have high mathematical ability | 53.125%         |

The table 7 showed that students’ point of view towards creativity and mathematics dominated by point of view that students who have high creativity does not mean they have high mathematical ability (53,125%). This point of view is in line with 40,625% students who thought that students who have high mathematical ability does not mean they have high creativity. These students’ point of views are in line with the results of the research by [6] that there is not always significant correlation between mathematical intelligence and mathematical creativity, however there is simmetrical correlation between both of them which is mathematical intelligence is found as the cause of mathematical creativity and otherwise.

According to Leikin and Mann [5], mathematical creativity is necessary in developing the students’ mathematical ability. Therefore, all students have to improve their awareness of the importance of creativity in mathematics [18]. However, the result on the table shows more than a half of the students did not realize that mathematics needs creativity. For this question, there is no another point of view added by the students. This is due to the students' knowledge related to creativity in mathematics is still shallow.
**Question 7: How do you overcome mathematical problems?**

| Statements | The Percentage |
|------------|----------------|
| I like answering mathematics question by trial and error | 59.375% |
| I like answering mathematics question by following the steps explained by the teacher | 46.875% |
| I like answering mathematics question through various ways | 12.5% |
| I like check and recheck the results of my answer on mathematics question | 21.875% |

The Table 8 indicated that more than a half of the students like to overcome mathematics question through trial and error, however not followed by liking to overcome mathematics question through various strategies and check and recheck the results of their answers. This is seen because both of those items had low percentage. Whereas both of those activities are important activities in overcoming mathematical problems. Some factors which inhibit creativity are the use of one strategy in finding the completion [6, 12] and do not recheck the solution of a mathematics problem. Therefore, answering mathematics question through various ways and evaluating their answer in the process of overcoming the problem and not only in the end are very important thing in overcoming mathematics problems [12].

From this statement, it reflected that almost half of the students were used to memorizing the problem solving steps suitable with what their teacher taught. This habit eventually will inhibit students’ creativity development [7, 19]. Learning and practicing algorithm procedure to solve routine mathematics problem which really gives disadvantage to mathematics creativity [20]. It can be seen that students were not used to solving problems based on steps according to Polya; understanding the problem, designing a plan, doing the plan, and rechecking the answer [21].

Some students also added statements. Five students answered other ways in solving mathematics problem. 3 students answered that they often cheated because they did not understand and ran out of time, 1 student used short for formula, and 1 other liked to check and recheck his answers of mathematics assignment with the problem solving he found in the internet.

**Question 8: In your opinion, what can push the students’ creativity in mathematics? Explain.**

In this session, the students were given open question related to their perception towards the things that can support their creativity in mathematics. Students’ answers were segmented, reduced, and categorized. Students answers from most dominant ones written in Table 9.

| Students’ Answers |  |
|-------------------|---|
| Students’ motivation in learning mathematics |  |
| Ability and students’ mindset in solving mathematics problem |  |
| Orderly and in details explanation by the teacher |  |
| Fun mathematics learning |  |
| Teacher’s creativity in explaining mathematics lessons |  |
| Understanding the mathematics formula |  |

Different from the answers of question 4, students’ answers towards this question are more various. At question 4, almost 50% students gave the same point of view which is: I expect teachers explain the lesson slowly, orderly, and in details, while the answers in Table 8 above only three or two students who had the same opinion. This showed that students’ understanding related to creativity in mathematics was still less.
Predominantly, according to the students, one of the deeply important aspects in the development of mathematics creativity is the teacher. This is in line that each effort to grow creativity in the class in the end depends on the teacher [7, 8, 22]. The teacher has to create learning environment that support the development of students’ mathematics creativity. Creative environment gives freedom to the students to apply imaginative ideas and find method or new solution towards open activity and non-routine problem [7].

In addition to the above answers, there were students said that making precise strategy in solving difficult problem in mathematics, not memorizing the formula, exercise in the form of story problems, discussion in order to understand and solve mathematics problem, solving the problem through various ways, and not cheating are the ways that the students think can push their creativity in mathematics. One of the students also wrote his point of view that creative people tend to think and there are many thinking activities in mathematics. According to [8], mathematical creativity can be propelled when the students encounter problems like problem-posing, let them do problems by using various methods and skills. The feeling of complacent will appear after thinking about creative experiment, or finding creative solution for a problem [23]. Only two students managed to discuss this way of solution.

It can be concluded that there is correlation between students’ perception on mathematics, creativity, and in both of them. Based on the data obtained from question 1, 2, and 4 can be concluded that the students generally: (a) see mathematics lesson difficult to understand, (b) want the mathematics class over as soon as possible when they learn mathematics, and (c) expect friendly mathematics teacher, can create fun mathematics learning process and completed by game, and explains the mathematics lesson slowly, orderly, and in details.

Students’ point of view towards creativity can be seen from their answers at questions 5 and 8. Based on question 5, it can be concluded that more than a half of the students has understood creativity as someone’s skill in creating something new and different and almost a half of the students understood creativity as someone’s skill in solving a problem in different ways. However students’ answers at question 8 seemed unsure. This showed that students’ understanding and students’ knowledge related to mathematics creativity was still less. Only some students who realized that the teacher is the main factor in developing students’ creativity, one of them is by teaching mathematical concepts creatively.

Questions 6, 3, and 7 explored students point of view related to the correlation between mathematics and creativity. From the data, it shows that more than half of the students have understood that students with high creativity do not mean they have high mathematical ability. Then followed by the understanding by almost a half of the students who understood that students who have mathematical ability do not mean they have high creativity. Meanwhile the answer of questions 3 informed that dominantly the students felt difficult if faced to different mathematical problem from the problem that the teacher explained in front of the class and they like to memorize the existing formula. While the answers of question 7 revealed that the students like to solve mathematical problems by using trial and error system. This predicted because of the students were difficult in memorizing the formula. Beside that, the students were accustomed to the steps taught be the teachers and applied them in solving the mathematical problems.

In this research, generally, the perception on mathematics and creativity reflects the level of motivation and mathematical ability although it does not happen to all students. Most of them have realized that the importance of mathematics and understood the definition of creativity however they still have less positive perception on mathematics and do not yet have a good knowledge about creativity and mathematics. However there were some students succeeded in showing positive perception on both of them. This result emphasizes us to not let the students especially with low mathematical ability trapped on negative perception on mathematics. By knowing students perception on mathematics and creativity, it is expected to be one of source for teachers and observer in education to do some improvements. Futhermore, we can help students to get involve in mathematics learning and open to the challenges.
4. Conclusion
Based on the results of this research, it appears that the subjects, students in one of junior high schools in Sleman with low mathematical ability, generally have a negative perception to mathematics. Students predominantly view mathematics is very elusive and they want the mathematics class to end quickly. As for creativity, half the students have a sufficient understanding of creativity but they have perception that creativity is not needed in mathematics. This is supposedly because the students are generally not accustomed to doing mathematics in various ways. Therefore, in general, students have not shown positive perception toward mathematics and creativity. The results of this research reinforce the results of previous related research that students’ perceptions of mathematics and creativity significantly correlated with mathematical ability.

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