Analysis of mathematics anxiety of junior high school students

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Abstract. Mathematics anxiety (MA) is a feeling of depression and fear when someone is faced with a mathematical problem. MA can affect student achievement in mathematics. This study aims to determine MA of junior high school students. The method used in this research is descriptive. The sample of this study was 94 students of junior high school. MA instruments are modified from some valid and reliable test MA. The results showed that the MA of junior high school students was at a moderate level. Increased anxiety occurs in grade 8. The greatest student anxiety occurs when students are facing math tests and when completing math tasks. Students feel insecure when solving math problems, because students only memorize mathematical formulas and do not understand its meaning. The material in mathematics textbooks cannot be understood well by students. MA increases as students go to higher classes, and generally students do not want to have a career in the future associated with mathematics. Teachers have an important role in reducing the level of MA. Knowing about MA experienced by students is the first step of the teacher to make efforts to minimize MA.

1. Introduction

Bloom stated that the learning outcomes include cognitive, affective and psychomotor [1]. As well as cognitive, affective also plays a very important role in the learning of mathematics. Affective domain includes the attitudes, beliefs, motivations, emotions and all non-cognitive aspects of human thought [2]. Their affective role in mathematics education has been initiated by Polya since 1957 in the research problem solving which any hope, determination and emotions [2].

One of the affective domain in learning mathematics that attracted the attention of researchers is the anxiety of students of mathematics known as mathematics anxiety (MA). MA is one of the obstacles ontogenic students in mathematics [3]. Anxiety is an unpleasant emotional state or their sense of fear [2]. MA is the panic, helplessness, paralysis, and mental disorganization that arises among some people when they are required to solve a mathematical problem. It is both an emotional and cognitive dread of mathematics [4]. MA as feelings of tension, loss of hope, mentally confused and afraid when one is asked to manipulate numbers and solving mathematical problems [5]. MA is not only hatred in math (negative attitude towards mathematics) but it is a form of deep frustration or feeling depressed and helpless depth of a person when dealing with matters related to mathematics [6]. Thus, the study of mathematics as a process of learning mathematics should not have priority to cognitive aspects. Various other potential protégé must also obtain a proportionate attention in order to develop optimally.

Anxiety can motivate and also can cause loss of interest in students towards mathematics [7]. However, in general, the researchers assume that anxiety seriously impair the performance of student learning [8]. The researchers in the field of Supreme Court concluded that the MA is something that
damages the memory of the initial knowledge of mathematics students [9]. Student anxiety seriously impair the performance of students in mathematics tasks, otherwise reduce anxiety levels are consistently associated with improved achievement [10]. Martinez stated that Anxiety may be a greater block to learning math than supposed deficiencies in our school curricula or teacher preparation program [6]. There is a reciprocal relationship between poor math performance by MA [9-14]. Students who have a positive disposition towards mathematics tend to have more positive emotions and less negative emotions than those who have a negative disposition [1].

Lazarus stated that the Supreme Court began to take root and grow when the students were in elementary and secondary school [4]. The increase in MA starts since the beginning of junior high school and peaked at Grade 9 and 10 [10]. This is also supported by the results of research Aiken in 1976 that found a very strong correlation between the performance of mathematics and mathematics anxiety to occur at secondary school level [15]. So, MA increased when students take a higher class. This might be due to the mathematical material that is increasingly difficult to be understood by students at higher grade. There was also a shift away from thinking process of students from elementary school to junior high school.

MA can be caused by a factor of intrinsic and external student (extrinsic). Children who lack self-confidence is low will affect math skills in general [6]. As a result, he will always feel that he will never get good results in lessons and even he will likely get a failure. If it is actually experienced by a student and he will always feel anxious to follow the activities of learning mathematics. MA as it is intrinsic or trait anxiety.

Furthermore, MA which is extrinsic or state of anxiety can be caused by external factors such as a parent or teacher. Peker stating that the Supreme Court experienced teacher when the teacher teaching mathematics are feelings of anxiety and distress experienced by teachers when teaching concepts, theories, formulas, or solving mathematical problems [16]. This aspect of anxiety is different from the general aspects of math anxiety. If the math anxiety is generally associated with one's anxiety related to the lack of mathematical knowledge and confidence would be the math. Instead, teach math anxiety is anxiety individuals with regard to the ability to teach math [16]. High confidence and capability and good mathematical knowledge is a basic requirement for teachers in the teaching of mathematics [16]. Teachers who have inadequate competence can lead to low self-esteem. Thus, a teacher in addition to having a good knowledge in mathematics also must have good skills in teaching mathematics.

MA caused by the teacher, can be caused by the teachers themselves have no concern about mathematics as a result of the practices of learning that is not appropriate, such as less precisely teachers in managing learning, not structured instructional materials that support the achievement of competence and learning structure disorganized well [6]. Some of the list of causes of failure include; teaching is not good (bad teaching), book texts/materials that are less good (bad texts), and poor educational instrument (bad educational instruments) [17]. So, the teacher is one of the important variables that affect student achievement in mathematics. Mastery of subject matter, techniques and strategies for learning, skills in classroom management, communication skills of teachers and teacher's personality has an influence on the students' learning process.

2. Method

The method used in this research is descriptive method. Samples were 94 middle school students in Palembang, Indonesia, with details of 7th grade by 36 people, students in grade 8 were 29 people and 9th grade students as many as 29 people. Test anxiety is modified from several tests of math anxiety is standard such as, Mathematics Anxiety Rating Scale-Revised, The Fennema-Sherman, Mathematics Attitudes Scales, Test Anxiety, Attitudes Toward Mathematics Inventory (ATMI), Math Anxiety Test [5]. This test consists of 12 indicators developed into 28 items of questions. This test aims to determine how math anxiety of junior high school students.
3. Results and discussion

Based on the analysis item answers to questions, the number of students who answered strongly agree and agree to test math anxiety can be presented in the following table 1:

| Item | 7th grade | 8th grade | 9th grade |
|------|-----------|-----------|-----------|
|      | Total | %       | Total | %       | Total | %       |
| 1    | 5  14 | 22  76  | 21  72 | 15  13 | 36  9  | 31  5  | 17  |
| 2    | 5  14 | 18  62  | 7  24 | 16  11 | 31  18 | 62  9  | 31  |
| 3    | 4  11 | 14  48  | 4  14 | 17  15 | 42  13 | 45  16 | 55  |
| 4    | 3  8  | 13  45  | 6  21 | 18  16 | 44  21 | 72  17 | 59  |
| 5    | 5  14 | 15  52  | 9  31 | 19  5  14 | 10  | 34  6  | 21  |
| 6    | 3  8  | 13  45  | 12  41 | 20  4  11 | 0  | 0  3  | 10  |
| 7    | 8  22 | 20  69  | 7  24 | 21  2  6  | 8  28 | 3  10  |
| 8    | 9  25 | 8  28  | 9  31 | 22  7  19 | 12  | 41  9  | 31  |
| 9    | 33  92 | 26  90 | 26  90 | 23  6  17 | 6  21 | 11  38  |
| 10   | 21  58 | 18  62 | 6  21 | 24  15  | 42  18 | 62  11 | 38  |
| 11   | 5  14 | 2  7  | 7  24 | 25  14  | 39  12 | 41  10 | 34  |
| 12   | 6  17 | 18  62 | 2  7  | 26  16  | 44  14 | 48  13 | 45  |
| 13   | 8  22 | 14  48 | 16  55 | 27  6  17 | 12  | 41  7  | 24  |
| 14   | 24  67 | 28  97 | 17  59 | 28  11  | 31  16 | 55  11 | 38  |

Table 1. Result of MA test.

Description of items:
1. Mathematics is a difficult subject
2. I am not gifted in math
3. Learning mathematics makes me anxious and scared
4. Test score of math in my report cards are always low
5. I just memorize math formulas and ignorant
6. I was afraid to ask the teacher during a math lesson.
7. I feel anxious when told to blackboard during a math lesson
8. I worry that others consider me weak in math
9. I want to be involved in group discussions and class
10. I afraid of making mistakes when learning mathematics in the group
11. I was often out of the classroom during math lessons take place, because I feel anxious and afraid
12. Material in textbooks of mathematics cannot understand well
13. I understand math at the time in the classroom, but when they returned home none of which I understand
14. Parents and brother helped me in math
15. I was afraid to compete with other students in math
16. Difficulties and my fear of mathematics increased when rising to a higher class
17. I feel confident when solving math exercises
18. I felt anxious facing a math exam more than other subjects exam
19. Hands say a sweating and palpitations on seeing the math exam questions.
20. My stomach felt queasy when I started thinking about the exam
21. I felt shortness of breath, dry mouth and head suddenly became dizzy when working on the problems math exam
22. I do not know how to study for the math exam
23. I was reminded of my failure on the math test before 
24. I forget things I had learned earlier while working on math exams 
25. My brain suddenly could not think when doing the math test 
26. I was worried if having trouble in math in the future, though this time I understand it. 
27. I would go to college to college no math lessons 
28. I do not want to be a mathematician or math teacher

Table 1 shows that more than 50% of secondary school students stated that mathematics is a difficult subject. Grade 8 students turned out to have a higher anxiety responses compared to grade 7 and grade 9. Based on Table 1, note that as many as 22 students or 76% of students having trouble in math. Approximately 48% of students feel fear and anxiety in mathematics. The student anxiety that occurs when students are sent to the board (69% of students) and in the face of mathematics exam (72% of students), students do not feel confident when solving math problems (55% of students). In general, students simply memorize math formulas and do not understand its meaning (52% of students), students forget things previously learned when working on math exams (62% of students). The material in the book cannot be understood math students well (62% of students). Students only understand math at the time in the classroom, but when I got home none of them understand (55%). Difficulties and fears of students towards mathematics increased when it rose to a higher class (62% of students), and in the end the students do not want to have a career in future are related to mathematics (55% of students). It wanted the students are involved in discussion groups and classes (90% of students). Help parents and siblings is expected of students in math (97% of students).

Based on Table 1, nearly 50% of students are not confident in mathematics. Students who lack confidence and respect for the ability of low self-esteem, for example, will affect the general performance [6]. As a result, he will always feel that he will never get good results in lessons and even he will likely get a failure. If it is actually experienced by a student and he will always feel anxious in the following learning activities including learning mathematics. Math anxiety as it is intrinsic or trait anxiety. Research shows that the higher a person's confidence towards mathematics, the more likely it will be successful in the task [13], and the higher the person's confidence towards learning and the use of mathematics, the more likely he will continue his studies.

According to the table 1 is known that over 60% of students do not understand the material in the text books / materials. One of the failures in the teaching disclosed by Hilton is a book of texts / materials that are less good [5]. This is in accordance with the opinion of Cruikshank and Sheffield which states that if teachers do not successfully implement the seven important steps in learning, it will cause their students experience math anxiety [6]. Furthermore, they explain that the seven steps are teachers who indicate that they are happy with the math and make math fun, the teacher explains the usefulness of mathematics in their daily work, adjust the learning with student interest by setting short-term goals to be achieved and to facilitate learning activities so that students can be managed properly by using meaningful teaching methods [6].

|          | N  | Minimum | Maximum | Mean  | Std. Deviation |
|----------|----|---------|---------|-------|----------------|
| 7th grade| 36 | 45      | 80      | 59.83 | 8.062          |
| 8th grade| 29 | 52      | 91      | 69.48 | 8.475          |
| 9th grade| 29 | 47      | 84      | 62.69 | 8.014          |
| Valid N (Total) | 94 |         |         |       |                |

Table 2 illustrates that the average anxiety scores 7th grade students is 59.83, the mean average grade 8 math anxiety score was 69.48, and the average grade 9 math anxiety score was 62, 69. The average score
8th grade math anxiety is higher than the grade 7 and 9. This suggests that an increase in student anxiety from grade 7 to grade 8. Furthermore, based on the results of students' mathematics anxiety scores grade 7, 8 and 9, the category of math anxiety level of junior high school students can be seen in the Table 3 the following.

**Table 3. Level of MA.**

| Category | 7th grade | | 8th grade | | 9th grade | |
|----------|------------| |------------| |------------| |
|          | Total | % | Total | % | Total | % |
| Low      | 5    | 13.89 | 0    | 0  | 2     | 6.9 |
| Middle   | 31   | 86.11 | 25   | 86.21| 26    | 89.65|
| High     | 0    | 0    | 4    | 13.79| 1     | 3.45 |

Table 3 illustrates that, the anxiety level of junior high school students are at moderate levels of anxiety. For grade 7, students with low anxiety as many as 5 people (13.89%), anxiety were 31 people (86.11%), and no anyone at a high level. For grade 8, students who have anxiety were as many as 25 people (86.21%), and who have high anxiety there are as many people 4 people (13.79%), and no students who have high anxiety levels. To grade 9, students with low anxiety as much as 2 (6.9%), anxiety was as many as 26 people (89.65%) and high anxiety as many as one people (3, 45%). It is interesting that there is an increasing anxiety of students from the lower class to higher class levels [4]. Students who are at the level of anxiety being able to move the level to low or high levels of anxiety. Learning environments and situations that support can make children enjoy math or are in the positive cycle [18].

4. Conclusions
MA in junior high school are at moderate levels. Increased anxiety occurs in 8th grade students who are the greatest anxiety occurs when students face the mathematics exam and when completing math assignments. Students do not feel confident when solving math problems, because students just memorize math formulas and do not understand its meaning. The material in the book cannot be understood math students well. Math anxiety increased when students go up to a higher class, and usually students do not want to have future careers related to mathematics. Very dominant factor in the teacher gives an influence on students' mathematics anxiety. Teachers can improve students' mathematics anxiety and can also reduce anxiety math students. Teachers have an important role in reducing the level of math anxiety. Knowing about math anxiety experienced by students is the first step to make efforts to minimize teacher math anxiety.

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