The profile of student math-anxiety

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Abstract. The main objective of this research was to describe the level of anxiety of junior high school students (SMP and MTs) towards mathematics and to identify what symptoms most appeared in students. The study conducted in 10 SMP/MTs in Kulon Progo Regency, Yogyakarta, Indonesia, representing 66 SMP/MTs in Kulon Progo. The research subjects were 943 junior high school students of grade VII, VIII, and IX from eight SMP and two MTs. Data collected through instruments in the form of a Likert model psychology scale. The conclusion of this research is as follows. First, the level of students' anxiety towards mathematics (math-anxiety) was in a low category. Second, the percentages of students who have very low, low, moderate, high, and very high anxiety levels are 4%, 50%, 41%, 5%, and 0%, respectively. Third, the levels of anxiety of students towards mathematics are almost the same for each grade, which in the low category, except for grade VIII SMP who is in the moderate category. Fourth, psychological symptoms appear more often than physiological symptoms. Fifth, there are five questions that the most "often" and "always" answers. The items are as follows. First, I am relieved if the mathematics class is empty. Second, I am relieved if the math class ends. Third, I am upset if I have to learn mathematical material without being explained first. Fourth, I am shocked if my teacher gives a lot of math homework. Fifth, I am appalled if my teacher suddenly gives a math quiz. To reduce students' anxiety towards mathematics, it recommended for a mathematics teacher to use a humanist approach to learning.

1. Introduction

Many factors affect student learning outcomes, both factors from outside students themselves and factors from inside students [1]. Likewise, in learning mathematics, many researchers have examined the effect of attitudes, interests, and learning motivation on learning outcomes [2-3]. Another factor that also influences learning achievement is anxiety [4]. Students' anxiety about mathematics is known as math-anxiety.

There are several definitions of anxiety. In general, anxiety associated with panic or fear. Symptoms of someone who is anxious include fear, emotion, and dislike [5]. Especially for math-anxiety, a person's symptoms of mathematics anxiety include feelings of tension, helplessness, mental disorder, fear when asked to solve mathematical problems, and respond negatively to mathematics [6-9].

Other indicators that indicate someone is anxious about mathematics are low self-confidence, negative thinking patterns towards learning mathematics, feeling threatened, failing to reach potential
and, quickly forgetting with mathematical formulas [10–12]. Physiologically, the presence of mathematical anxiety indicated by sweaty palms, nausea, palpitations, and difficulty breathing [13].

There have been many research results that show a negative correlation between math-anxiety and student learning achievement [14–16]. However, if it can appropriately manage, math-anxiety can also be an internal motivation for students. Therefore, mathematics teachers must try to reduce or manage students' math-anxiety.

Until now, there has been a lot of strategies done by mathematics teachers to reduce the math-anxiety. Various innovative learning methods/approaches have been tried out in the class to minimize math-anxiety. Technological advances also help math teachers teach more fun. The question that then arises is, "are the majority of students still overly anxious about mathematics?"

This research conducted to obtain answers to five questions. The questions are as follows. 1) At what level is the junior high school students' anxiety about mathematics? 2) What percentage of students has very low, low, moderate, high, and very high anxiety? 3) Are the anxiety levels of grade VII, VIII, and IX students classified as the same? 4) What symptoms of anxiety most often appear in students; and (5) what do students dislike most in learning mathematics?

Research like this considered essential to help teachers and prospective mathematics teachers obtain accurate data related to students' math-anxiety profiles. For the Mathematics Education Study Program, the results of this study expected to be used as a basis for curriculum reconstruction, especially for Psychology Learning Mathematics lectures, taking into account the factors that affect student anxiety about mathematics.

2. Methods

2.1. Types and subject of the research

This type of research is descriptive. The variable described is junior high school (SMP/MTsN) students' anxiety about mathematics. The study was conducted in August 2018 in 10 SMP/MTs in Kulon Progo Regency, Special Region of Yogyakarta, representing 66 SMP/MTs in Kulon Progo Regency. The research subjects were 943 junior high school students grade VII, VIII, and IX from 8 junior high schools and 2 MTs in Kulon Progo Regency. The number of research subjects/respondents for each class illustrated in Table 1, following.

| Grade | SMP | MTsN | Total |
|-------|-----|------|-------|
| VII   | 256 | 57   | 313   |
| VIII  | 249 | 59   | 308   |
| IX    | 260 | 62   | 322   |
| Total | 765 | 178  | 943   |

2.2. Instruments for Data Collection

Data has been collected through instruments in the form of a Likert scale, with five alternative answers, namely "always, often, sometimes, rarely, and never" This instrument has been used to determine students' math-anxiety levels. The instrument consists of 34 statements. The instrument developed by the research team through Focus Group Discussion (FGD), then validated by experts and tested. The items in this instrument are valid with correlation coefficients for the validity of the items between 0.45 – 0.79 and reliable with a Cronbach's Alfa reliability coefficient of 0.948.

In the instrument used in this study, the indicators for math-anxiety classified into two, namely indicators derived from physiological and psychological domains. For physiological domains, the indicators are chest-pounding, sweating cold, want to pee, stomach ache, want to vomit, headache, and difficulty to sleep, both when students study mathematics and when facing math tests. As for
psychological factors, the indicators are fear, fidgety, upset, nervous, and worry. The instrument grilles are as follows.

Table 2. Instrument Grilles

| Indicators       | No | Statements                                                                 |
|------------------|----|-----------------------------------------------------------------------------|
| **Physiological Domains** |    |                                                                             |
| Chest-pounding   | 1. | My chest is beating fast when going to a math test.                         |
|                  | 2. | My chest pounding if my name mentioned by the math teacher to go forward, working the problem in front of the class. |
|                  | 3. | My chest is beating fast if approached by the math teacher while working on the questions during practice, quiz, or exam. |
|                  | 4. | My chest is pounding when the teacher starts returning the results of homework or tests that he has rated. |
| Sweating cold    | 5. | I am sweating cold when going to a math class.                             |
|                  | 6. | I am sweating cold during math class.                                      |
|                  | 7. | I am sweating cold while working on a math test.                           |
|                  | 8. | I am sweating cold while working on the math problem on the board.         |
| Want to pee      | 9. | I want to pee when going to start the math class.                          |
|                  | 10. | I want to pee when starting the math test.                                |
| Stomachache      | 11. | I have a stomach-ache during math class.                                  |
|                  | 12. | I have a stomach-ache when working on a math test.                        |
| Want to vomit    | 13. | I feel nauseous when going to math class.                                  |
| Headache         | 14. | I have a headache (dizziness) during math class.                          |
|                  | 15. | I have a headache (dizziness) when working on math tests.                 |
| Difficult to sleep | 16. | I have difficulty sleeping soundly at night when there is a math test tomorrow. |
|                  | 17. | I have nightmares at night when there is a math test tomorrow.             |
| **Psychological Domains** |    |                                                                             |
| Fear             | 1. | I am afraid if appointed by a math teacher to present the results of the discussion in front of the class. |
|                  | 2. | I am afraid if appointed by a math teacher to work on the problem on the board. |
| Fidgety          | 3. | I am uneasy waiting for the math class to start.                           |
|                  | 4. | I am uneasy waiting for a math test.                                      |
|                  | 5. | I am relieved if the mathematics class is empty.                          |
|                  | 6. | I am relieved if the math class ends.                                      |
| Upset            | 7. | I am upset if having to learn mathematical material without being explained first. |
|                  | 8. | I am upset if the teacher gives a lot of math homework.                    |
|                  | 9. | I am appalled if my teacher suddenly gives a math quiz.                    |
|                  | 10. | I am upset if the math test questions are essays.                         |
|                  | 11. | I am upset if the math test questions have many calculations.              |
| Nervous          | 12. | I have difficulty concentrating when studying math.                       |
|                  | 13. | I find it hard to concentrate on a math test.                             |
|                  | 14. | I am nervous if someone asks about math.                                  |
|                  | 15. | I can suddenly forget the formula when working on math problems.          |
Worry
16. I do not want to sit in the front seat when studying math.
17. I pretend to be sick so that I am not allowed to go to class if there is a math test schedule.

2.3. Data analysis
The criteria for classifying math-anxiety levels as in Table 3, with \( M = (\text{maximum score} + \text{minimum score})/2 \), and \( S = (\text{maximum score} - \text{minimum score})/6 \).

| Total Score (X) | Category       |
|-----------------|----------------|
| \( X \leq M - 1.8 S \) | Very Low       |
| \( M - 1.8 S < X \leq M - 0.6 S \) | Low            |
| \( M - 0.6 S < X \leq M + 0.6 S \) | Moderate       |
| \( M + 0.6 S < X \leq M + 1.8 S \) | High           |
| \( X > M + 1.8 S \) | Very High      |

Because the instrument consists of 34 items with each item having a score of 1, 2, 3, 4, or 5 then \( M = (5.34 + 5.1) / 2 = 87.5 \) and \( S = (5.34 - 5.1) / 6 = 27.5 \), so anxiety each student can be categorized as in Table 4. below.

| Total Score (X) | Category     |
|-----------------|--------------|
| \( X \leq 46 \)  | Very Low     |
| \( 46 < X \leq 73 \) | Low          |
| \( 73 < X \leq 101 \) | Moderate    |
| \( 101 < X \leq 128 \) | High        |
| \( X > 128 \)   | Very High    |

For the category of anxiety level in each grade (VII, VIII, and IX), the limit multiply by the number of respondents. Then for each category of anxiety level, frequency and percentage were calculated compared to the total respondents.

3. Result and discussion
3.1. The level of students' anxiety towards mathematics
Of the 765 junior high school students who were respondents of this study, most of them had low or moderate anxiety levels, as illustrated in Table 5.

| Grade | Very Low | Low | Moderate | High | Very High | Total Students |
|-------|----------|-----|----------|------|-----------|----------------|
| VII   | 18       | 134 | 96       | 8    | 0         | 256            |
| VIII  | 5        | 100 | 120      | 24   | 0         | 249            |
| IX    | 4        | 141 | 106      | 9    | 0         | 260            |
| Total | 27       | 375 | 322      | 41   | 0         | 765            |

From the data in Table 5, it can say that although most respondents have low or moderate anxiety about mathematics, there are still 41 respondents who have high anxiety about mathematics. Almost the same as the condition in SMP, the majority of respondents from MTs students also have anxiety about mathematics at a low or moderate level, as illustrated in Table 6. From the data in Table 6, it can
say that although most of the MTs students have anxiety about mathematics in the low or moderate category, some have anxiety at a high and very high level.

Table 6. Frequency distribution of MTs students by level of anxiety

| Grade | Number of Students in the Anxiety Category | Total Students |
|-------|------------------------------------------|----------------|
|       | Very Low | Low | Moderate | High | Very High |                      |
| VII   | 3         | 37  | 16       | 1    | 0         | 57                  |
| VIII  | 1         | 32  | 24       | 2    | 0         | 59                  |
| IX    | 9         | 26  | 23       | 3    | 1         | 62                  |
| Total | 13        | 95  | 63       | 6    | 1         | 178                 |

After the data in the two tables are combined, then from 943 SMP and MTs students who become respondents, it can be known that the percentage of students at each level of anxiety as contained in this table.

Table 7. Percentage of students at each level of anxiety

| Category | Very Low | Low | Moderate | High | Very High | Total |
|----------|----------|-----|----------|------|-----------|-------|
| SMP      | 27       | 375 | 322      | 41   | 0         | 765   |
| MTs      | 13       | 95  | 63       | 6    | 1         | 178   |
| Total    | 40       | 470 | 385      | 47   | 1         | 943   |
| Percentage (%) | 4 | 50 | 41 | 5 | 0 | 100 |

When compared, the percentage of students who have very low, low, moderate, high, and very high levels of anxiety for each grade VII, VIII, IX in both SMP and MTs. as in Table 8, are relatively almost equal.

Table 8. Comparison of the percentage of SMP and MTs students for each level of anxiety

| Grade | Very Low SMP | Low SMP | Moderate SMP | High SMP | Very High SMP | Total SMP |
|-------|--------------|---------|-------------|----------|---------------|-----------|
| VII   | 7            | 52      | 65          | 38       | 3             | 0         |
| VIII  | 2            | 40      | 54          | 48       | 10            | 0         |
| IX    | 2            | 15      | 42          | 41       | 3             | 0         |

Using the criteria as listed in Table 4 can be obtained categories of anxiety levels for each grade(VII, VIII, IX) and overall, as contained in Table 9 follow.

Table 9. Math-Anxiety category for students

| Grade | SMP (n=256) | MTs (n=249) | Overall (n=943) |
|-------|-------------|-------------|-----------------|
| VII   | 17893       | 19130       | 68403           |
| VIII  | 18824       | 3799        | 4304            |
| IX    | 43520       | 44300       | 10540           |
| Possible total score | 43520 | 44300 | 10540 |
| Category | Low | Moderate | Low | Low | Low | Low | Low |

From the results in Table 9, it can conclude that overall the anxiety level of 943 junior high school and MTs students in Kulon Progo Regency who were respondents of this study was still relatively low. Only the eighth-grade students of junior high school were of moderate anxiety. This result is different from the researchers' estimation that the closer the final school exam (grade IX), the higher the anxiety
level of students. Overall, the level of student anxiety is relatively low. This finding is in line with the results of Aunurrofiq and Junaedi [17] which found that 97.14% of respondents grade XI students had low anxiety levels. However, the existence of around 46% (Table 7.) of respondents who have moderate or high levels of anxiety indicates that their anxiety about mathematics still needs to be the teacher's attention.

3.2. Things that students dislike when learning math and its possible solutions

Although overall, the anxiety level of SMP and MTs students in Kulon Progo Regency is relatively low, several things need to be considered due to the symptoms or indicators that appear frequently. Among the 34 questions, five items have been answered "always" or "often" by most respondents (around 30%). The five statements are: (a) I am relieved if the mathematics class is empty; (b) I am relieved if the math class ends; (c) I am upset if I have to learn mathematical material without being explained first; (d) I am upset if my teacher gives a lot of math homework; and (e) I am upset if my teacher suddenly give a math quiz. These five indicators belong to the psychological aspect. These things need to get the attention of mathematics teachers.

The data revealed that many students are happy if the math lesson is empty and feel relieved when the math lesson is over shows that they do not enjoy the math lesson. This might be caused by the fact that not every student has logical-mathematical intelligence. Those who do not have this type of intelligence will tend not to enjoy taking math lessons. Therefore mathematics teachers must be able to design learning activities that allow each student to enjoy while participating in mathematics learning, whatever their type of intelligence. Approaches to learning mathematics based on Gardner's multiple intelligence theory can be the choice of mathematics teachers [18].

Students who do not like math lessons without an explanation first (for example, get direct definitions, formulas, or problems) are most likely because these students have difficulty understanding them. Therefore mathematics teachers must not start learning mathematics with definitions or formulas. This matter is essential to reduce student anxiety [19]. Apperception at the beginning of the lesson is very necessary so students can use prior knowledge to learn mathematics on that day.

It is natural for many students who do not like to get a lot of math homework. For this reason, teachers must be selective in providing homework. The purpose of providing homework must be clear, and students must get feedback from their homework.

Related to giving a quiz suddenly, there are the students who are not happy because, of course, they are not ready. Therefore teachers must inform students that at any time the teacher will give a quiz. If students can prepare themselves better, they will not worry.

The things that should make students anxious when taking a math test or exam should be of concern to the teachers because many studies conclude that there is a negative correlation between anxiety and achievement [14]. According to Widjajanti [19] mathematics learning should be carried out with a humanist approach to reduce student anxiety.

In principle, the humanist approach in learning mathematics emphasizes the importance of teachers paying attention to the human aspects of students when learning. The teacher must understand that students are diverse and that learning is not only concerned with the cognitive side but also students' feelings.

In carrying out mathematics learning with a humanist approach, the teacher advised using the following steps. First, the teacher must demonstrating the usefulness or beauty of mathematics at the beginning of learning. Second, he/she must start learning with the real thing, do not start learning by providing definitions or formulas. Third, he/she needs controlling their emotion and full of enthusiasm. Fourth, he/she must giving excellent attention to all students. Fifth, he/she must giving respect to every student's learning progress. Sixth, he/she must making varied learning activities. These steps have the potential to reduce students' anxiety about mathematics [19].
4. Conclusion
In general, from 943 SMP and MTs students who were respondents in this study, it can be concluded that students’ anxiety about mathematics is at a low and moderate level. More detailed results are as follows. First, the level of students' anxiety towards mathematics (math-anxiety) was in a low category. Second, the percentages of students who have very low, low, moderate, high, and very high anxiety levels are 4%, 50%, 41%, 5%, and 0%, respectively. Third, the levels of anxiety of students towards mathematics are almost the same for grade VII, VIII, and IX, for both SMP and MTs students, which are in the low category, except for grade VIII SMP who are in the moderate category. Fourth, psychological symptoms appear more often than physiological symptoms. Fifth, there are five questions that the most "often" and "always" answers. Of the five questions that get the most "always/often" answers, the following conclusions have reached. Many students are happy if their math class is empty. They also felt relieved when the time for the mathematics lesson was over. Students are also not happy if, at the beginning of mathematics, learning their teacher does not explain first. Also, many students don't like math homework a lot. It turns out; many students do not like it when their math teacher suddenly gives a quiz.

The results of this study have implications for the need for mathematics teachers to learn to manage student anxiety about mathematics. To reduce students' anxiety towards mathematics, it recommended for a mathematics teacher to use a humanist approach to learning or use a learning approach based on Gardner's multiple intelligence theory.

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