

Portrait of Math Anxiety on Junior High School Students

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Abstract— This study is a survey research with a qualitative approach that aims to describe math anxiety in junior high school students. The research subjects were 141 students of state junior high schools and state islamic junior high schools in Bantul Regency who came from five schools in the high, moderate, and low categories. The sample in this research was determined using stratified proportional random sampling technique. The instrument used was in the form of a student math anxiety questionnaire consisting of 12 indicators which were broken down into 32 favorable and unfavorable statements. The results showed that math anxiety in junior high school students was at low criteria with an average score of 76.74. At the high level of math anxiety students are at low criteria with an average value of 73.07. Meanwhile, at the moderate level, math anxiety students are at low criteria with an average score of 77.30. Whereas at the low level of math anxiety students are at low criteria with an average value of 78.14. Thus, it can be stated that the students' average math anxiety in the three stratum is at a low criterion.

Keywords— Anxiety, Mathematics, Junior High School Students.

I. INTRODUCTION

Anxiety is one of the emotional and psychological aspects that exist in a person. Reference [1] defined anxiety as a psychological condition of a person where feelings of tension and uncomfortable worry are triggered by ambiguous circumstances. That is, anxiety refers to a general feeling of anxiety and distress about a form of threat or danger that is unclear, pervasive, uncertain, and often shapeless. Meanwhile, reference [2] said that anxiety is a term that refers to the basic innate emotions that produce a series of cognitive and physical characteristics such as restless thoughts, increased heart rate, sweating, and so on. Whereas, reference [3] stated that anxiety is a condition that involves feelings of fear and worry which are very unpleasant.

In school learning, especially mathematics, anxiety when studying and solving math problems is generally referred to as math anxiety. Reference [4] stated that math anxiety is a very negative emotional reaction to everything related to mathematics. These reactions create negative feelings that can compromise a person's ability to manipulate numbers and solve math problems. Math anxiety is something that should not be allowed to continue continuously, because if the level of anxiety increases too high, students

may not be able to work properly [5]. In addition, students who have math anxiety tend to perceive mathematics as something unpleasant. This is in line with the opinion of reference [6] which stated that mathematics has an image as a difficult subject, thus making mathematics not well accepted by society.

Math anxiety is an emotional reaction characterized by feelings of stress and anxiety in situations that involve solving math problems [7], [8]. According to reference [9], mathematics anxiety is a condition that can hinder students' ability to reach their potential in terms of learning experiences and mathematics assessments in class, both as an emotional response and as an object of fear or concern. This opinion is in line with reference [10] who stated that math anxiety is a problem that can have a negative impact on academic achievement and children's future job prospects. Because math anxiety is the main cause of math difficulties in children [11].

The relationship between math anxiety and students' mathematics learning scores at school can be strengthened by the results of research conducted by reference [12] stated that students who get high math scores show lower math anxiety levels than students who have higher math anxiety levels. Likewise, research reference [13] stated that excessive math anxiety can interfere with student academic achievement. Students who have anxiety in mathematics tend to have lower mathematics achievement.

Math anxiety is caused by several factors, including environmental, cognitive, and personal factors. Environmental factors can come from family pressure to gain higher performance or be caused by negative experiences in mathematics classes or with certain mathematics teacher attitudes. Then cognitive factors are caused by aspects that involve innate characteristics such as learning styles and low intelligence in solving math problems. Meanwhile, personal factors are caused by feelings of low self-esteem or lack of self-confidence and lack of self-control in dealing with feelings of frustration and the influence of previous negative experiences on mathematics [14], [15].

Math anxiety can not only act as a motivator, but can also be a factor that hinders students' ability to think mathematically. Because according to reference [16] & [17], mathematics anxiety refers to a person's response to feelings that lead to actions in the form of doubt and fear so that they can interfere with math problems in the form of manipulating numbers or symbols, math calculations, and solving various math problems both in ordinary life and when faced with academic situations.

Students who experience math anxiety in the learning process will have an impact on their learning achievement. This is in accordance with Hembree's opinion which stated that one of the psychological factors that affect student achievement and attitudes towards mathematics is math anxiety [18]. Therefore, teachers must strive to know and understand the anxiety experienced by students and try to use appropriate teaching and learning strategies so that students are able to overcome the anxiety they experience. Based on the description above, the purpose of this study is to develop calculus learning videos, especially on the topic of the volume of revolution with the disk method, and to describe the perception of students, pre-service mathematics teachers, and in-service mathematics teachers on volume of solid of revolution learning video.

II. METHODS

This type of research is a survey research that aims to describe students' math anxiety in mathematics learning. Judging from the type of analysis approach, this research was conducted using a qualitative approach. The population of this research were students of grade VIII of state junior high schools and state Islamic junior high schools in Bantul Regency, Yogyakarta Special Region Province. Because the population is large enough, it is necessary to do a sampling technique so that it can truly represent the entire population in a representative manner. Therefore, the sampling technique used in this research was a stratified proportional random sampling technique. So that, the sample size used in this study amounted to 141 students.

The data collection technique used in this study was a questionnaire. The student's math anxiety questionnaire used was in the form of a closed questionnaire, so that the respondent only had to choose the answers provided by the researcher. The math anxiety questionnaire includes three dimensions consisting of 12 indicators that are broken down into 32 favourable and unfavourable statements. These three dimensions include cognitive, affective, and somatic. In preparing the questionnaire, it was carried out in several stages, namely determining the conceptual definition or construct to be measured, determining the operational definition, determining indicators, and then developing it into statements written on the questionnaire. The scale used in this questionnaire is a Likert scale which consists of five alternative answer choices, namely always, often, sometimes, rarely, and never. This questionnaire was developed based on conceptual definitions which then obtained aspects that can be used to measure student math anxiety.

To determine students' math anxiety level during the learning process, the average technique is used. The score ranges and criteria scale for converted students' math anxiety can be seen in Table 1 below [19].

Table 1. Conversion of the Math Anxiety Scale

Interval	Total Score	Criteria
$X \leq \mu - 1.5\sigma$	$X \leq 64.05$	Very Low
$\mu - 1.5\sigma < X \leq \mu - 0.5\sigma$	$64.05 < X \leq 85.35$	Low
$\mu - 0.5\sigma < X \leq \mu + 0.5\sigma$	$85.35 < X \leq 106.65$	Moderate
$\mu + 1.5\sigma < X \leq \mu + 1.5\sigma$	$106.65 < X \leq 127.95$	High
$X > \mu + 1.5\sigma$	$X > 127.95$	Very High

Information:

- X : The total score of the questionnaire obtained
 μ : Ideal of mean
 $[(\text{maximum score} + \text{minimum score})/2]$
 σ : Ideal standard of deviation
 $[(\text{maximum score} - \text{minimum score})/6]$

III. RESULT

The measurement of the math anxiety questionnaire among junior high school students was categorized into three strata consisting of high, moderate, and low stratum. Descriptive data about students' math anxiety at each stratum are presented in Table 2 below.

Table 2. Description of Student's Math Anxiety at Each School Stratum

Description	Stratum			
	High	Moderate	Low	Overall
Mean	73.07	77.30	78.14	76.74
Standard Deviation	15.37	10.96	17.01	14.67
Maximum Score	116	100	113	116
Minimum Score	54	51	44	44

Based on Table 2, information can be obtained that the average math anxiety score of students from each stratum is different. The difference in the average math anxiety of students between high and moderate stratum is 4.23. Then the difference between the high and low stratum is 5.07. Meanwhile, the difference between moderate and low stratum is 0.84. Overall, the average score range for students' math anxiety from high, moderate, and low stratum is on the low criteria, namely 76.74.

The following Table 3 also presents data on the frequency and percentage of students in each math anxiety category at each stratum, which is calculated based on a predetermined score range.

Table 3. Distribution of Frequency and Percentage of Students' Math Anxiety Criteria at Each School Stratum

Criteria	Stratum						N Students	%
	High		Moderate		Low			
	F	%	F	%	F	%		
Very High	0	0.00	0	0.00	0	0.00	0	0.00
High	1	3.33	0	0.00	1	1.72	2	1.42
Moderate	6	20.00	16	30.19	18	31.03	40	28.37
Low	14	46.67	32	60.38	27	46.55	73	51.77
Very Low	9	30.00	5	9.43	12	20.69	26	18.44
Amount of	30		53		58		141	100.00

Based on Table 3, it can be obtained information that the frequency and percentage of math anxiety students at each stratum with the number of research subjects, namely 141 students, had different results. At the 141 research subjects there were 0 (0.00%) students with very high criteria, 2 (1.42%) students with high criteria, 40 (28.37%) students with moderate criteria, 73 (51.77%) students with low criteria, and 26 (18.44%) students with very low criteria. At the 30 students who are at high stratum, none of the students are included in the very high criteria, while at the high criteria there is 1 student and in the moderate criteria there are 6 students. For low criteria there are 14 students and at very low criteria there are 9 students. The difference between high and moderate criteria is 5 students, while the difference between high and low criteria is quite large, namely 13 students. Then for the high and very low criteria there is a difference of 8 students.

In moderate stratum students with 53 research subjects, there were also none of the students who entered the very high or high criteria, but there were 16 students on the moderate criteria and 32 students on the low criteria and there were only 5 students on the very low criteria. Furthermore, out of 58 students who are at low stratum there are no students with very high criteria and only 1 student is on high criteria, while in moderate criteria there are 18 students and at low criteria there are 27 students and at very low criteria there are 12 students. At the three strata, both high, moderate, and low stratum, there are no students who have very high math anxiety criteria, while the most dominant criterion lies in moderate stratum students with low criteria.

In addition to the frequency distribution and percentage of students' math anxiety criteria at each stratum, the students' mean math anxiety can also be described based on the math anxiety criteria for all indicators of math anxiety in this research. To find out the students' average math anxiety on all the indicators that have been formulated for each stratum can be seen in the following Figure 1.

Based on Figure 1, information can be obtained that the highest average score of student math anxiety is at indicator 1, namely difficulty in understanding mathematics subject matter, while the lowest student math anxiety is at indicator 9, namely heart palpitations, abdominal pain, and sweating when studying math material.

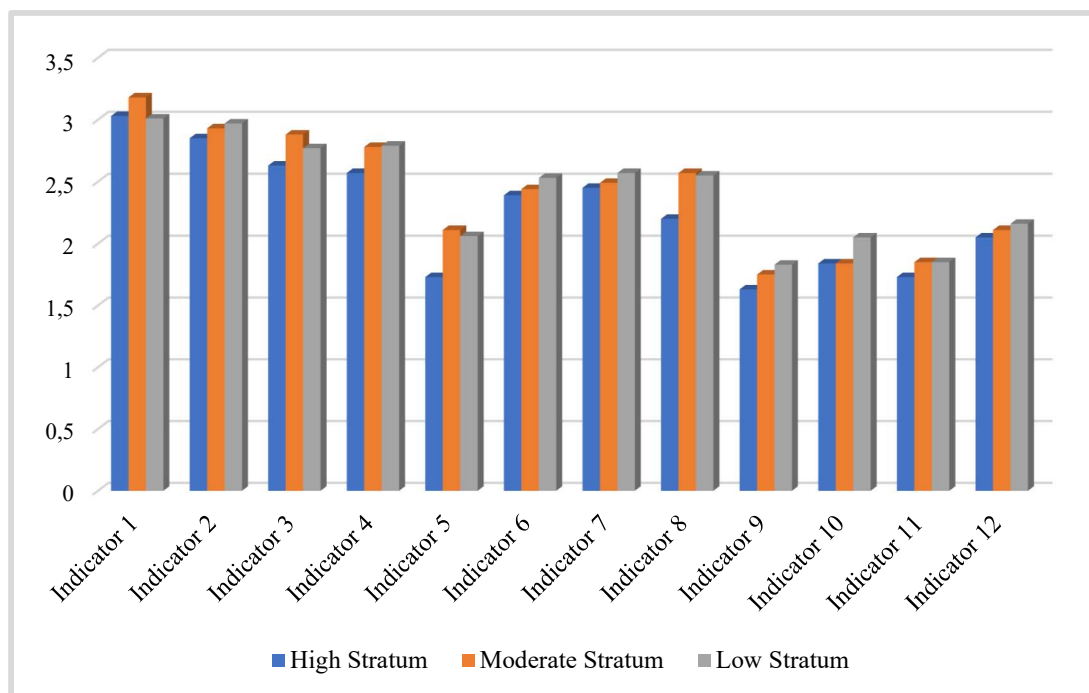


Fig 1. Diagram of Average Math Anxiety Students on All Indicators in Each Stratum

For high-stratum students with a total of 30 students, the average score of math anxiety is 73.03 so that it is at low criteria. Meanwhile, for the moderate stratum students with the number of research subjects as many as 53 students, the average score of math anxiety was 77.30 so that it was in the low criteria. Whereas for low stratum students with the number of research subjects as many as 58 students obtained an average score of 78.14 math anxiety so that it is at low criteria. The percentage value of students' math anxiety in the mathematics learning process at the three strata can be seen in the following Figure 2.

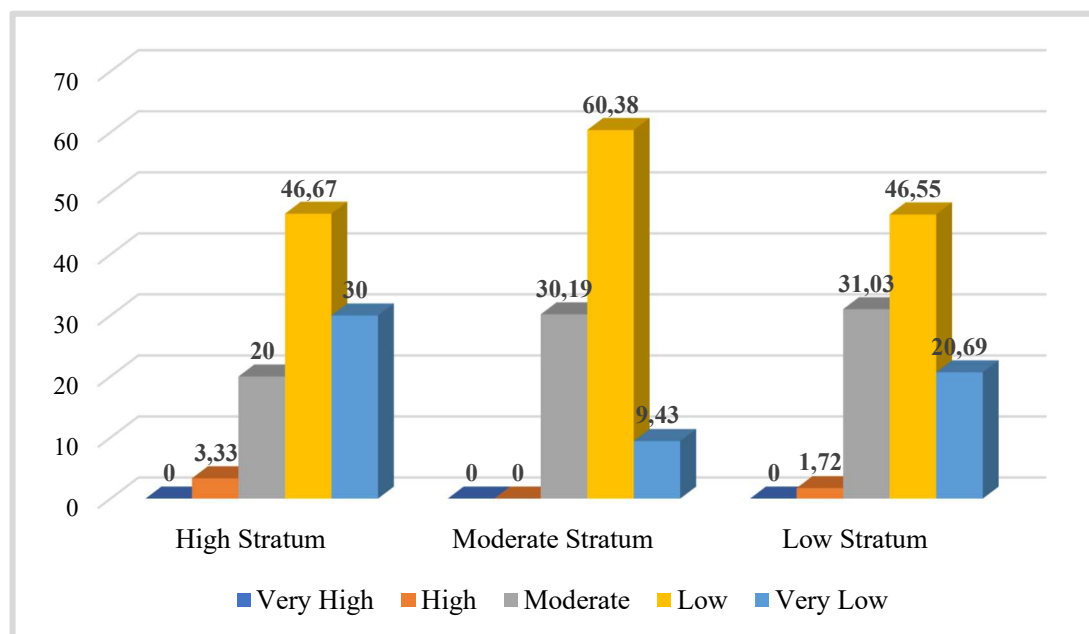


Fig 2. Percentage Diagram of the Math Anxiety Criteria for Students at Each Stratum

IV. DISCUSSION

Based on Figure 2, information can be obtained that the percentage value of student math anxiety at high stratum is consecutively starting from very high, high, moderate, low, and very low criteria, namely 0%, 3.33%, 20%, 46.67%, and 30%. Meanwhile, the percentage of students' math anxiety at moderate stratum was consecutively starting from very high, high, moderate, low, and very low criteria, namely 0%, 0%, 30.19%, 60.38%, and 9.43. %. Meanwhile, the percentage of students' math anxiety at low stratum, respectively, starting from very high, high, moderate, low, and very low criteria, namely 0%, 1.72%, 31.03%, 46.55%, and 20.69. %. This shows that the average percentage of students' math anxiety in the three strata has an average math anxiety score that is at a low criterion by obtaining an average math anxiety score of 76.74.

Based on the description above, it can be concluded that high stratum students have the criteria for an average math anxiety which is in the low category. This is consistent with the expectation that schools at high stratum have low levels of math anxiety. In theory, according to reference [20] students with high levels of math anxiety will have high learning difficulties as well, and vice versa. Meanwhile, reference [21] stated that one of the causes of mathematics learning difficulties is student math anxiety. This is in line with reference [22] who said that the low student achievement in mathematics is always accompanied by math anxiety. Students who have high mathematics learning achievement will tend to have low math anxiety. In addition, reference [23] stated that one of the anxiety symptoms experienced by students in the learning process is cognitive symptoms. These symptoms include difficulty in memory, concentration, problem solving and attention.

V. CONCLUSION

Math anxiety in junior high school students is at low criteria with an average value of 76.74. At the high level of math anxiety students are at low criteria with an average value of 73.07. Meanwhile, at the moderate level, math anxiety students are at low criteria with an average score of 77.30. Whereas at the low level of math anxiety students are at low criteria with an average value of 78.14. Thus, it can be stated that the students' average math anxiety in the three strata is at a low criterion.

Research that has been carried out on junior high school students has provided descriptive data and information about students' math anxiety in mathematics learning. However, there are still limitations to this research, namely when students fill out the math anxiety questionnaire, the researcher is unable to control as a whole, causing the possibility of other factors that affect students, such as honesty, physical health, and psychological conditions.

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