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MATHEMATICAL ANXIETY OF ELEMENTARY STUDENTS DURING THE COVID-19 PANDEMIC

KECEMASAN MATEMATIS SISWA SEKOLAH DASAR SELAMA PANDEMI COVID-19

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Abstract

This study aimed to describe the students' mathematical anxiety during online learning at a private elementary school in Bandung, Indonesia. This research used a quantitative method. The subjects of this study were 28 fifth-grade students, a teacher, and students' parents. The instruments were questionnaires for students and an interview list for the teacher and parents. The data was then analyzed quantitatively and descriptively through tables and charts. The result indicated that each aspect of mathematical anxiety in this study showed a low category for affective and high for cognitive and somatic aspects. The anxiety of elementary school students should be a particular concern for teachers in carrying out learning so as not to interrupt the learning process.

Keywords: *Mathematical Anxiety, Covid-19 Pandemic, Elementary School Student*

Abstrak

Penelitian ini bertujuan untuk mendeskripsikan kecemasan matematis siswa selama pembelajaran online di sekolah dasar swasta di Bandung, Indonesia. Penelitian ini menggunakan metode kuantitatif. Subjek penelitian ini adalah 28 siswa kelas V, seorang guru, dan orang tua siswa. Instrumen yang digunakan adalah angket untuk siswa dan daftar wawancara untuk guru dan orang tua. Data tersebut kemudian dianalisis secara deskriptif kuantitatif melalui tabel dan grafik. Hasil penelitian menunjukkan bahwa setiap aspek kecemasan matematis dalam penelitian ini menunjukkan kategori rendah untuk aspek afektif dan tinggi untuk aspek kognitif dan somatik. Kecemasan siswa sekolah dasar harus menjadi perhatian khusus bagi guru dalam melaksanakan pembelajaran agar tidak mengganggu proses pembelajaran.

Kata Kunci: *Kecemasan Matematis, Pandemi Covid-19, Siswa Sekolah Dasar*

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1. Introduction

It is well known that Covid-19 has significantly impacted all aspects of life, including education. Covid-19 has occurred in all educational institutions, including elementary schools need to anticipate the transmission of Covid-19 to teachers and

students. Children infected with Covid-19 usually do not show symptoms, indicating that the transmission of Covid-19 is high-speed and requires special treatment (Felicia, 2020).

The Ministry of Education and Culture issued Circular Letter No. 15 of 2020 concerning Guidelines for Organizing Learning from Home in an Emergency Period of the Spread of Covid-19. It aims to ensure the fulfillment of the rights of students to obtain educational services during the Covid-19 emergency, protect the citizens of the education unit from the harmful impact of Covid-19, prevent the spread and transmission of Covid-19 in education units, and ensure the fulfillment of psychosocial support for educators, students, and parents (Kemendikbud, 2020). Through these rules, the implementation of learning in elementary schools, which were formerly face-to-face, was transferred online at home with direct guidance by parents and virtual teacher monitoring.

However, after more than a year of implementing online learning that utilizes advanced technology devices and several learning platforms, apart from showing a positive impact because learning continues even during a pandemic, negative effects cannot be avoided. Research proved that boredom and decreased interest in learning are due to the failure of students and teachers to overcome obstacles (Budiman, 2021). During online learning, some students also mentioned that cheating and earning points are easier while studying online, making them lazier (Gogberashvili, 2021). They reduce motivation to learn, have low student scores and feel bored (Afif, Mistar, & Karimullah, 2021). Based on some of the negative impacts of learning, it tends to lead to student attitudes toward learning.

Anxiety in learning mathematics or mathematical anxiety is one aspect of the attitude affected when students learn mathematics online. Anxious students will appear afraid of failing, cause them doing cheat, have no intention of learning, or have low motivation. They feel difficulties in doing certain things, worry about being judged by others that they cannot do something well, have a blank mind, feel confused, have difficulty breathing, fast heartbeat, and feel uncomfortable. Students' psychics influence their learning as a research result found that study quality (56.7%) and psychological health (54.7%) (Fares, Saadeddin, Al-Tabosh, Aridi, El-Mouhayyar, Koleilat, Chaaya, & El-Asmar, 2016). In addition, mathematical anxiety is a student's fear of mathematics. Anxiety arises when a person is in a very threatening situation (Putri, Wahyudy, Yuliyanto, & Nuraeni, 2020). This anxiety can cause students to forget and lose confidence, leading to math avoidance and decreased math achievement (Widyaningsih, Waluya, & Kurniasih, 2018). Thus, mathematical anxiety is an inconvenience, fear, and panic when students participate in mathematics learning or solve problems so that their self-confidence, interest, and achievement in learning mathematics decreases. A study said mathematical achievements in elementary school students are influenced by psychological factors, such as math anxiety (Karlimah, Andriani, & Suryana, 2020).

Several studies have been conducted related to mathematical anxiety. Research on the relationship and influence between variables shows a negative and significant relationship between mathematical anxiety and elementary school students' mathematical problem-solving abilities (Parungato & Helmon, 2020). There is also a significant effect between anxiety and emotional intelligence on mathematics learning outcomes of fifth-grade elementary school students (Cahyani & Wulandari, 2021). In several previous studies related to mathematical anxiety, among others, there is a significant effect of the application of concrete-pictorial abstract on the decrease in

students' mathematical anxiety in elementary schools (Putri, Muqodas, Wahyudy & Nuraeni, 2020). At the same time, the ICT learning shows that the intensity of elementary students accessing ICT devices is very high and is not followed by student achievement and math anxiety (Sunanih & Novikasari, 2019). It is still related to technology, where the game-based e-book learning model does not show a significant difference between the mathematical anxiety ratings of the three groups (Hung, Huang, & Hwang, 2014).

Based on the previous research results, it was shown that mathematical anxiety was only investigated regarding its increase or decrease and its relationship and influence with several variables in the elementary school field, especially when implementing online learning during the Covid-19 pandemic through quantitative research. However, there was still limited research on describing elementary school students' mathematical anxiety based on its indicators during the pandemic. Therefore, this research described an in-depth description of elementary school students' mathematical anxiety when implementing online learning. Thus, this study aimed to obtain information on the description of elementary students' mathematical anxiety during online learning.

2. Research Method

This research was conducted quantitatively with a case study method related to elementary school students' mathematical anxiety. It aimed to understand the description of elementary school students' mathematical anxiety during the Covid-19 pandemic. The subjects involved were 28 fifth-grade students in a private elementary school in Bandung. The instruments used were a questionnaire to measure students' mathematical anxiety and interviews to get an in-depth understanding from teachers and parents of the mathematical anxiety experienced by each student. The instrument used was a modified questionnaire developed by Putri, Wahyudy, Yuliyanto, & Nuraeni (2020). The following table 1 shows the modified mathematical anxiety instrument.

Table 1. Blueprint of Mathematics Anxiety Questionnaire Instrument

Element	Indicator	Statement	Level
Affective	Fear of what they are doing	1. I often skip school in math subjects, especially fractions that have many calculations.	High
		2. I always listen to math lessons because it is challenging, including discussing fractions with lots of calculations.	
		3. I like to close the webcam when zoom meeting on every math lesson so that the teacher does not see and appoint me to answer.	
		4. I always turn on the webcam when zoom meeting to focus on listening and giving questions about the fractions taught by the teacher.	
	Do not want to do	1. Whenever I get a fraction problem, I	Medium

Element	Indicator	Statement	Level
	something that should be done	find it difficult to solve it because there are many numbers to count.	
	The expectation of difficulties in doing something	1. No matter how complex the fraction problem is, I always try to answer it.	Low
		2. I have no difficulty working on Fractions because I am always careful to count numbers.	
Cognitive	Worry about being judged by others that he/she cannot do things well	1. I always refuse when I am appointed to answer fraction questions because my friends might laugh at me if the answer is wrong.	High
		2. I always answer questions confidently, even though the answer is wrong. So, I know the correct answer.	
		3. I permanently hide the question paper from friends and parents when the score is below 70.	
	Empty mind	1. I find it difficult to concentrate on fraction problems, so I run out of time.	Medium
		2. Mathematics is a complicated subject, and many fractions are difficult to remember.	
		3. I always remember the material I have studied, even though the material is challenging to understand.	
		4. I always focus when working on all math problems, including fractions.	
	Feeling confuse	1. I always feel unsure of my answers, including on fraction questions.	Low
		2. I feel confident that my answers are included in the fraction.	
Somatic	Difficult to breathe	1. My chest feels tight when I get a math score under 70.	High
		2. My chest feels tight when my friends laugh at me for answering a math problem incorrectly.	
		3. My heart beats fast every time I give out maths exam papers.	
		4. My heart beats fast when I am asked to explain the answer to a fraction problem in front of other friends.	
	Heartbeats fast	1. I feel calm when I am asked to explain the answer to a Fraction	Medium

Element	Indicator	Statement	Level
		problem in front of other friends.	
		2. I have difficulty sleeping if there is a math exam tomorrow, especially on fractions.	
	Uncomfortable feeling	1. I will sleep well even though there will be a math exam tomorrow, including the fractions topic.	Low
		2. I often go back and forth to the toilet to urinate because I am worried that I might be unable to answer fraction questions.	

The instruments that have been compiled in table 1 are then analyzed descriptively using tables and pie charts for easy understanding.

3. Results and Discussion

3.1 Results

The data relating to quantitative descriptive of students' anxiety were reviewed from all three aspects of mathematical anxiety. The results and analysis of the data were presented by the research objectives that had been formulated. The value obtained from the results of this descriptive analysis was then used as a basis for understanding students' mathematical anxiety during online learning.

Table 2. Students' Mathematical Anxiety

Variable	Maximum Score	Minimum Score	Mean	Standard Deviation	Criterion
Mathematical anxiety	69	49	60.54	5.0147	High

Table 2 shows the results of elementary school students' mathematical anxiety during online learning. The result was categorized as high based on a mean score (60.54). The tendency of the results of this study refers to the variable intervals in table 3 below:

Table 3. Student Mathematical Anxiety Criteria and Tendencies

Interval	Category	Frequency	Percentage
$x > 62.33$	Very high	12	42.86%
$62.33 > x > 59$	High	10	35.71%
$59 > x > 55.67$	Low	2	7.14%
$x < 55.67$	Very low	4	14.29%
Total		28	100%

Based on table 3, more than 50% of elementary students had very high mathematical anxiety during online learning. While in each aspect, the level of anxiety can be seen in table 4.

Table. 4. Recapitulation of Mathematical Anxiety of Each Aspect

	Maximum Score	Minimum Score	Mean	Standard Deviation	Tendency
Affective	20	13	16.1789	1.8669	Low
Cognitive	28	19	23.5714	2.1504	High
Somatic	26	15	20.7857	2.5438	High

Table 4 shows mathematical anxiety in somatic and cognitive aspects had a high tendency and a low tendency in the affective aspect. The result of this analysis refers to the interval of each aspect of mathematical anxiety as follows:

Table. 5. Recapitulation of Mathematical Anxiety on Attitude Aspects

Interval	Category	Frequency	Percentage
x > 17.67	Very high	6	21.43%
17.67 > x > 16.5	High	7	25%
16.5 > x > 15.33	Low	6	21.43%
x < 15.33	Very low	9	32.14%
Total		28	100%

Table 5 shows more than 53% of students had low mathematical anxiety on the affective aspect. Thus, more than half of the respondents were afraid of what was being done, did not want to do something that was supposed to be done, and expected difficulty in doing something.

Table. 6. Recapitulation of Mathematical Anxiety on Cognitive Aspects

Interval	Category	Frequency	Percentage
x > 25	Very high	11	39.29%
25 > x > 23.5	High	6	21.43%
23.5 > x > 22	Low	5	17.86%
x <22	Very low	6	21.43%
Total		28	100%

Table 6 shows that more than 60% of students had high mathematical anxiety on cognitive aspects. Thus, more than half of the respondents feared being judged by others when they could not do something well, showed empty thoughts, and felt confused.

Table. 7. Recapitulation of Mathematical Anxiety on Somatic Aspects

Interval	Category	Frequency	Percentage
x > 22	Very high	10	35.71%
22 > x > 20.5	High	9	32.14%
20.5 > x > 19	Low	5	17.86%
x <19	Very low	4	14.29%
Total		28	100%

Table 7 shows more than 70% of students had high mathematical anxiety on somatic aspects. Thus, more than half of the respondents found breathing difficult and

their hearts racing; the feeling was uncomfortable. Percentage-level aspects of mathematical anxiety could be seen in the diagram in figure 1 below:

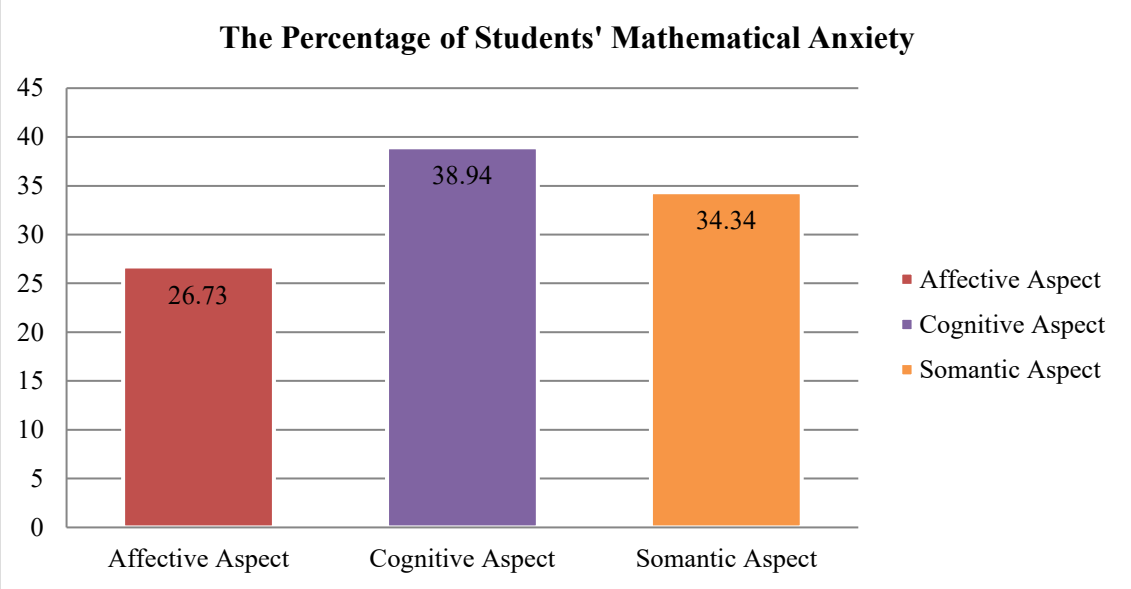


Figure 1. Students' Anxiety Level

Based on figure 1, the cognitive aspect was higher than the effective and somatic aspects. This result shows that the students' anxiety in learning mathematics on the cognitive aspect had an effort of 38.94%. It was marked by students experiencing worry about being judged by others and that he/she could not do things well, empty minds, and feeling confusion. Furthermore, the somatic aspect was at 34.34%, which was marked by fear of what they were doing, did not want to do something that should be done, and the expectation of difficulties in doing something. The last, the lowest aspect was the affective aspect at 26.73%, marked by difficulty breathing, fast heartbeats, and uncomfortable feelings.

Mathematics anxiety experienced by elementary school students, especially in grade 5, was strengthened by interviews. The researchers interviewed mathematics teachers (AGR) and students' parents, who also played a role in helping and assisting children in studying at home during the Covid-19 pandemic. The results of the interviews are shown in table 8 as follows:

Table 8. Analysis of Student Mathematical Anxiety Interviews during Online Learning

Anxiety Aspect	Research Subject	Observed Activities	Conclusion
Affective	AGR, 31 years old	1. Students often turn off the camera amid learning using zoom meeting.	1. Assistance was not optimal. 2. Students needed motivation from their parents to learn mathematics. 3. Students did not intend to do things that should be done (prefer to play games
	NEW, 42 years old	1. Parents accompanied students learning when getting math homework. 2. Parents need to motivate students to learn mathematics.	

Anxiety Aspect	Research Subject	Observed Activities	Conclusion
	RKS, 36 years old	1. Students were not confident in answering math problems.	and close the zoom camera) while learning mathematics. 4. Students were unsure and shy to ask questions when learning mathematics.
	RCL, 38 years old	1. Students were playing games for math exams. 2. Parents always gave directions for students to learn mathematics.	
	PSA, 49 years old	1. Students like to play games after the task is complete. 2. Students were less optimal learning assistance because their parents were working. 3. Students were shy to ask questions when learning mathematics. 4. Students need always to be motivated to learn.	
Cognitive	AGR, 31 years old	1. Students received information from parents about learning difficulties at home. 2. Students found irregularities in the inability of the basic concepts (PTMT).	1. Students did not like math. 2. Students lacked confidence. 3. Students worried about getting bad grades. 4. Students were less focused on learning. 5. There was a difficulty when learning Mathematics at home. 6. There were occurrences of misconceptions in understanding the material.
	NEW, 42 years old	1. Students worried that they would not get satisfactory results on math tests. 2. Mathematics was less favored by students who were often stuck.	
	RKS, 36 years old	1. Students liked math but were not confident. 2. Less thorough in the field of mathematics. 3. Students worried if they got bad grades in mathematics. 4. Students worried about remedial when they would face math tests.	
	RCL, 38 years old	1. It was hard to focus on math.	

Anxiety Aspect	Research Subject	Observed Activities	Conclusion
		2. Students worried if they got bad grades in mathematics.	
	PSA, 49 years old	1. Students did not like math. 2. Students were less focused on the mathematics material being studied. 3. Students liked to experience misconceptions about mathematical formulas.	
Somatic	AGR, 31 years old	1. Reward and punishment were always implemented to anticipate.	1. Students tended to be open and communicative with their parents. 2. Students felt anxious, had difficulty sleeping, and were nervous when dealing with mathematics. 3. Students had a fever when they faced mathematics. 4. Parents or teachers gave positive rewards and punishments to overcome students' anxiety.
	NEW, 42 years old	1. Students tended to be closed (often tell their own stories) and had parental communication. 2. Students felt anxious about math tests. 3. Students had difficulty sleeping when they were going to learn mathematics. 4. Students found it difficult to coordinate with other students during face-to-face learning.	
	RKS, 36 years old	1. Students were open and communicative with their parents. 2. Parents gave rewards in the form of goods and positive punishment in the form of motivation.	
	RCL, 38 years old	1. Students were open and communicative with their parents. 2. Parents gave verbal rewards such as praise and positive punishment in the form of motivation.	
	PSA, 49 years old	1. Students were open and communicative with their parents. 2. Students got a fever when	

Anxiety Aspect	Research Subject	Observed Activities	Conclusion
		they wanted to take a math exam.	
		3. Students were nervous about the math test.	
		4. Parents gave verbal rewards such as praise and positive punishment in the form of motivation.	

Based on the interview analysis, the mathematical anxiety of elementary students on affective aspects during online learning was in a low category. It was interpreted that the mathematical anxiety of students in online learning indicated that there was no intention of doing things that should be done when facing mathematics. Respondents explained that the 5th-grade elementary school needed a lot of motivational encouragement. Meanwhile, cognitive aspects were in the high category. Respondents stated that children were worried about getting bad grades and were not confident with math. While in the somatic aspects, children felt anxious, had difficulty sleeping, were nervous, and even had a fever when facing math. For more details, the results of this research analysis are presented in table 9 as follows:

Table 9. Recapitulation of Research Analysis Results

Anxiety Aspect	Questionnaire Analysis	Interview Analysis	Trend
Affective	16.17 (26.73%)	1. Assistance was not optimal. 2. Students needed motivation from their parents to learn mathematics. 3. Children did not intend to do things that should be done (playing games and closing the zoom camera) while learning mathematics. 4. Students were unsure and shy to ask questions when learning mathematics.	Low
Cognitive	23.57 (38.94%)	1. Students did not like math. 2. Students lacked self-confidence. 3. Students worried about getting bad grades. 4. Children were less focused on learning. 5. There was a difficulty when learning mathematics at home. 6. There were occurrences of misconceptions in understanding the material.	High
Somatic	20.78	1. Students tended to be open and	High

Anxiety Aspect	Questionnaire Analysis	Interview Analysis	Trend
	(34.34%)	communicative with their parents.	
		2. Students felt anxious, had difficulty sleeping, and were nervous when dealing with mathematics.	
		3. Students had a fever when they faced mathematics.	
		4. Parents gave positive rewards and punishments to overcome students' anxiety.	

3.2 Discussion

Based on the results of questionnaire analysis and interviews of respondents, it was known that students experience the highest mathematical anxiety in cognitive aspects. In the cognitive aspect, anxiety was expressed by feeling pessimistic about doing problems, worried that the work results were bad, unsure of their work, and afraid of being laughed at if they were unable to do the problem (Parungato & Helmon, 2020). The result of this study was in line with Berliana & Adirakasiwi (2021), who stated that math anxiety significantly affected students' learning outcomes. The high cognitive aspect of the students' anxiety would certainly impact their learning achievement.

Because of various limitations when learning online, the students' mathematics was less favourable, leading to a lack of confidence in students, worry about getting bad grades, and less focus on learning. One aspect of students' confidence in solving problems was the psychological index, which was the embodiment of pleasure when doing an activity (Yuliyanto, Turmudi, Putri, Muqodas, & Rahayu, 2021). In the cognitive aspect, the students' incomprehension of basic material concepts should have been understood. In addition, the students' mathematical anxiety was heavily influenced by environmental factors, namely the students' lack of confidence in their ability and feeling that others had more logical-mathematical abilities (Hastuti, Umam, Eclarin, & Perbowo, 2021). The limitations of online learning significantly affected the motivation and anxiety of these students. The limitations of online learning were a problem that led to decreased motivation to learn (Sembiring, 2021).

In the somatic aspect, the results indicated that most students felt anxious, had difficulty sleeping, and were nervous shortly before facing the math exam. Their parents sometimes complained about their children's concerns in facing the exam. There were even students who got a fever. It was known that almost all students tended to be open and communicative to their parents. When finding these indicators, teachers and parents tried to provide motivation and positive rewards and punishments to overcome students' anxiety. Rewards and punishments have been known to affect physiological arousal during student approach behaviour and avoidance (Le, Wang, Zhornitsky, Dhingra, Zhang, & Li, 2019) and have a variety of affective reactions and motivational states to feedback (Ding, Wang, Zou, Song, Xiao, Huang, & Li, 2017). This impacted avoidance in the following learning and facing mathematical problems.

The lowest aspect of mathematical anxiety encountered in this study was the affective aspect. In this aspect, the students turned off the camera and reasoned the internet signal was less stable, and there were even some students who shared the focus

of learning time by playing games. That happened due to less assistance from parents. Students needed motivation from parents and teachers to be willing to learn harder in math learning. If parental assistance were maximal, it would align with the student's learning achievement and lower their mathematical anxiety. The results showed a relationship between the frequency of math homework assistance and parental success, student class level, and student achievement level. Other causes were inadequate technological facilities and concentration that were disrupted due to addiction to online games, hindering the learning process. Many students had limited facilities to support online teaching, such as limited connections, inadequate data packages, and no computers, living in rural areas far from internet access. This situation could cause the learning gap became stronger (Nadeak, Naibaho, Sunarto, Tyas, & Sormin, 2021).

4. Conclusion

From the results and discussion of this study, it can be concluded that students still have high levels of math anxiety. Mathematical anxiety in cognitive and somatic aspects was higher than in affective aspects. The cognitive aspect became the highest aspect of students' mathematical anxiety. Most students stated that they felt their knowledge and mathematical abilities were still lacking. In addition, they also felt less competent in mathematics. Therefore, these students need adequate material reinforcement, content, and mathematical knowledge, as well as the opportunity to ask questions and particular times when support is not possible classically. This research implied that by understanding the aspects of students' anxiety, the teacher could design learning according to the needs of students according to their level of anxiety, such as opening the lesson cheerfully, and smiling, so that students still felt embraced and learned with fun even from a distance. Furthermore, parents' role at home was to understand children's feelings based on aspects of mathematical anxiety. Parents should be able to guide their respective children in the best and most happy way to minimize student's math anxiety.

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