



## A preliminary study on the formulation of indicators and definitions of mathematical bitterness related to teacher treatment

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### Abstract

Teachers are responsible for helping students to understand and admire subjects, which means they need first to appreciate what is supposed to be taught. Meanwhile, some intern teachers detest several subjects due to the unpleasant treatment received from their tutors. This study intends to clarify the definition of mathematical bitterness and develop its indicators. The respondents were seven third-year students at Pelita Harapan University, Indonesia. Data were collected using questionnaires and interviews and analyzed through descriptive qualitative with a phenomenological approach. The results showed that the indicators of bitterness in mathematics sprang from the following, 1) having experienced unpleasant treatment from a mathematics teacher for a long time, 2) having a negative view of mathematics, 3) feeling untalented in mathematics, 4) viewing the mathematics teacher as unfriendly, 5) poor mathematics learning performance, and 6) having high mathematical anxiety. The proposed definition of *bitterness* is a negative perception of mathematics that is built from the accumulation of past experiences that affect the student's response to this subject. Hence, further studies are needed to provide solutions that help to heal students of their math bitterness.

**Keywords:** mathematical bitterness; mathematics school; phenomenology; pre-service teacher

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## Introduction

Mathematics is essential and relevant in everyday life because through this subject, an individual can practice accuracy (Ramos-Christian et al., 2008), logical reasoning (Greenes et al., 2004; Lesh et al., 2013), and systematic thinking (Lesh et al., 2013). However, mathematics is often viewed negatively as a rigid and complex subject by students and the wider community (Hayati & Ulya, 2018; Picker & Berry, 2000). Amirali (2010) discovered that most students worldwide disliked this subject because it evoked several negative emotions (Gafoor & Kurukkan, 2015). Scarpello (2007) identified the main factor leading to students disliking mathematics as anxiety based on previous experiences in the classroom. According to Vukovic et al. (2013), mathematics anxiety is negatively correlated with its learning achievement; for example, it causes students not to enjoy the subject, has poor perceptions, and cannot see its usefulness in everyday life. It is consistent with Kargar et al. (2010), who stated that students with high mathematical anxiety tend to have low mathematical thinking scores and attitudes. It implies that students with mathematical anxiety need help to enjoy and feel the benefits of the subject. Scarpello (2007) identified that teachers are responsible for reducing math anxiety and helping students deal with challenges while learning; therefore, these teachers are expected to adopt effective learning practices.

Brandt and Chernoff (2015) discovered that the word "mathematics" raises various unpleasant memories due to past experiences, one of which is influenced by teachers' treatment because not all can create effective learning. Even more fatal, the teacher causes dislike in mathematics as they often get violent when students do not measure up to expectations. Several investigations showed that cases of teacher violence in schools are still common (Devries et al., 2015; Kızıltepe et al., 2020; Muis, 2017; Muis et al., 2011), while some have correlated the factor of violence in schools with students academic performance (Baker-Henningham et al., 2009; Mertoglu, 2015). Furthermore, it has been observed that the academic performance of students who experienced violence at school is usually poor. According to Hayati and Ulya (2018) and Hannula et al. (2005), teachers' manners are strategies for attracting students' attention to mathematics. In achieving this goal, teachers must first appreciate and explore mathematics before being able to help students realize its beauty (Dirgantoro & Soesanto, 2021). However, this is made more difficult when the intern teacher already has bitterness towards mathematics due to previous experience, especially regarding teachers' treatment from the previous school level.

Investigations about mathematical bitterness have yet to be found explicitly. Meanwhile, several findings examined the psychological phenomenon in students, such as their views, beliefs, conceptions, attitudes, and emotions that either support or hinder continuous mathematics learning (Hannula et al., 2005; Kaasila et al., 2006). Larkin and Jorgensen (2015) specifically identified attitudes that were vital, inseparable, and often associated with anxiety, disability, and hopelessness as an expression of negative experiences in mathematics when receiving poor-quality teaching. Gafoor and Kurukkan (2015) further highlighted mathematics as a subject that evokes many negative emotions when students try to learn the subject. Larkin and Jorgensen (2015) discovered that students often express these negative emotions based on

their feelings towards mathematics, such as hatred, boredom, frustration, and wanting to cry whenever they want to learn the subject. These motivated the exploration of potential bitterness towards mathematics among prospective elementary school intern teachers, particularly those treated unpleasantly by their tutors.

The Elementary School Teacher Education study program is for students who are going to work as elementary school teachers. Based on the Constitution of the Republic of Indonesia No. 14 of 2005, "Teachers are professional educators with the primary role of educating, teaching, guiding, directing, training, assessing, and evaluating students from childhood through formal education, basic education, and secondary education." A teacher, therefore, needs to be equipped with four main competencies, namely pedagogic, personality, social, and professional, which have been defined by [Dirgantoro \(2018\)](#) as follows, 1) Pedagogic competence is the ability to understand the nature of students and learning, 2) Personality competence deals with being an example for students in behavior and speech, 3) Social competence is the ability to interact with students, parents, and subjects around the learning environment, and 4) Professional competence is the ability to master in-depth learning material/content.

Furthermore, elementary school teachers must be proficient in various subjects to fulfill professional competence based on the Attachment Copy of the Minister of National Education Regulation Number 16 of 2007, verses 1 to 3. It implied that prospective elementary school teachers must have qualifications in several major subjects, such as mathematics, Indonesian language, science, social studies, and Civics, to perform their role as a tutor. [Faridah et al. \(2020\)](#) explained that professional competence in the teacher's mastery of learning materials helped to create conducive learning conditions because this competency is positively related to the quality of learning by the student ([Kunter et al., 2013](#)). [Cess-Newsome \(2006\)](#) found that the main factor influencing teaching plans was the differences in teachers' beliefs and ideas about what they are capable of teaching. It is the reason [Jacob et al. \(2020\)](#) suggested that teachers need to know the content and pedagogical because, without these skills, students are likely to experience learning difficulties.

Therefore, this study aims to build math bitterness indicators based on intern teachers' past experiences. A competent mathematical definition of bitterness was formulated regarding these indicators, which was further analyzed and developed into an instrument capable of detecting students' perceptions of mathematical bitterness. The questions to be answered include: "what are the indicators of math bitterness related to the treatment of the teachers, and what is a good definition of mathematical bitterness?"

## Methods

This study was qualitative descriptive, with a phenomenological approach to provide an in-depth understanding of the phenomena experienced by individuals ([Mitchell, 2018](#)). [Adams and Manen \(2017\)](#) also supported the selection of this phenomenological approach by deeply reflecting on the various meanings, orders, and feelings in humans. Interests have been developed to capture the bitterness toward mathematics learning that hit students based on

mathematics teachers' treatment at their previous schools. This interest has led to a deeper study of this phenomenon in different stages by referring to Creswell (2014), as illustrated in Figure 1.

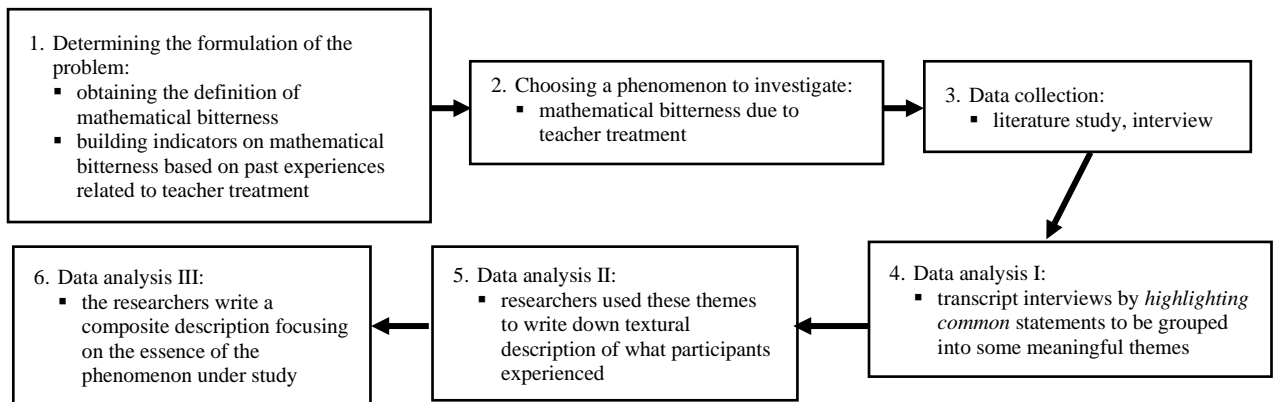


Figure 1. Diagram of phenomenological studies

Thirty-four intern teachers (2 males and 32 females) were selected to participate in this study using purposive sampling. These participants are Elementary School Teacher Education students taking PSAP (Planning, Strategy, Assessment, and Learning) Elementary School Mathematics courses. In this course, intern teachers were guided and trained to be able to teach mathematics at the elementary school level. They were asked to fill out a questionnaire using the Microsoft Forms platform containing five questions of branching type. The questions have been validated by three panelists who are psychology, mathematics education, and primary education experts. In the first question, students were asked about their preference for mathematics, of which there were only two choices: yes and no. Out of 34 participants, 19 students liked mathematics, indicating 55.88%, while the remaining 15 representing 44.12%, disliked the subject. Afterward, the respondents were asked the following question: about the causes of their love for mathematics. This study aimed to answer the two questions formulated by focusing on the participants who expressed their dislike for mathematics based on their experience of teachers' treatment that affected their performance.

It was observed from the questionnaire that seven respondents, representing 46.67%, disliked mathematics due to past experiences in the form of teacher treatment factors. This number is undoubtedly well suited for phenomenological studies since Creswell recommended that the range of subjects to be sampled for phenomenological studies were 5-25 people (Creswell, 2014; Rahiem, 2021). It is noteworthy that these seven students come from different regions of Indonesia, such as North Sumatra, Lampung, Central Java, Maluku, Central Sulawesi, and East Nusa Tenggara, and they have different cultural backgrounds, habits, and customs.

Data were collected through semi-structured interviews involving seven students, which has been explained previously. The study team conducted the interview process online, and was recorded using the Zoom Meeting application. Each subject was interviewed individually at a different time. Meanwhile, the participants were understood to answer honestly and openly before the interview. The participants were assured that the results were treated confidentially

to provide security and comfort. Interviews were conducted in-depth by asking several questions to examine the bitterness intern teachers felt about the previous treatment by their mathematics teacher, and three experts in psychology validated these questions before being used in interviews. The validation results are a question revision, and the following are the final questions used.

1. What forms of unpleasant treatment (verbal, physical, or both) have you received from a math teacher? Tell me in detail.
2. How often have you experienced unpleasant treatment from the math teacher?
3. At what level did you experience the most bitter treatment from a math teacher?
4. How did that bitter experience make you view mathematics then and now?
5. How did that bitter experience make you view yourself?
6. How did that bitter experience make you view mathematics teachers in general?
7. How did this bitter experience affect your achievement in mathematics?
8. What bitterness did you feel at that time that still remains today? Is it in the form of feeling depressed, lazy to learn mathematics, indifferent attitude towards mathematics, or in other forms (emotions or behavior)?

After this interview, the seven students' video recordings were translated verbatim into transcripts accurately. They were analyzed collaboratively by the study team to find essential points (coding) in order to answer the problem statement. The analysis phase includes three stages (Creswell, 2014), as shown in Figure 1. The first is to analyze the interview transcripts by highlighting general statements to be grouped into meaningful themes. The second is to use the themes to write a "texture description" of what the participants experienced, and the third is to write a composite description that focuses on the essence of the phenomenon being studied.

## Results

The interview transcripts were analyzed and coded by each study team. Afterward, the equating perceptions were discussed and analyzed in detail. The results of the analysis and coding conducted based on the questions in the given semi-structured interviews are described below. In addition, the researchers will present the transcript sample for each question.

### **Question 1. What forms of unpleasant treatment (verbal, physical, or both) have you received from a math teacher? Tell me in detail.**

The seven subjects had different experiences of unpleasant treatment from the teacher. The five types of unpleasant treatment that teachers inflicted on students include.

Here is presented the transcript sample during interview process. The researchers use terminology "I" for representing interviewer, and "S" for student as respondent.

*I: What forms of unpleasant treatment (verbal, physical, or both) have you received from a math teacher? Tell me in detail.*

*S: When I was in elementary school, my math teacher was nice. My teacher often motivated us, and the lesson was relatively easy for us to be understood. However, that teacher was*

ruthless when I entered grades 5 and 6. For example, if we only did 3 out of 5 problems given, we got pinched in our stomachs, regardless of whether male or female students. Alternatively, if we had a mistake during math learning, we got physical and mental judgment, such as getting pinched or being labeled as “stupid students.”

*I: Then, how was your math teacher in junior high school level?*

*S:* As I entered junior high school, my math teacher was crueler than before. Instead of being labeled as a “stupid student.” I was claimed as a student who knew nothing, and other students were comparing me with a statement: “You are dumb and stupid. Your other friends were able to solve the problem, but you were unable to solve it”. Others often compared us during math learning. So, since I was in junior high school, I hate mathematics.

*I: Ok, we are very sorry to hear that. And then, can you tell us about your math teacher in senior high school level?*

*S:* Well, as I entered senior high school, I got the same treatment. My math teacher was a bad-temper person. When there was a case where a few students were late in submitting the assignment or we were only able to solve several questions, then we got mocked. We were mocked with rude words that contained animal figures. We were even labeled as the animal itself. For example, I still remember one moment when my math teacher stated to me: “Your parents had been in vain to school you. It is better to educate pig rather than you”. After that, I felt very hurt by the statement, which made me get excommunicated by my friends.

**Table 1.** Teacher's treatment of students

Aspect	Explanation
Verbal	Labeling “stupid”, saying "useless", analogizing students with animals, comparing students, and demeaning students such as “you are not able to do it”, 'go home and fry value 0 (eggs)'. Pinching (stomach), throwing chalk at students, throwing erasers at students, and hitting the student's hand with a ruler.
Physique	Hitting a wooden ruler against the table, pounding the table, and throwing student books.
Creating an intimidating atmosphere	Just give assignments, no explanation, and not focusing on teaching but telling life experiences.
Teacher teaching method	Does not care about students, is only money-oriented; gets angry when students do not understand, and rarely attends class.
Teacher integrity	

**Question 2. How often do you experience unpleasant treatment from a math teacher?**

The seven subjects stated that they often experienced unpleasant treatment, and it occurred at all levels of education, from elementary through junior high to high school.

The sample of transcript during interview process is presented below.

*I:* How often do you experience unpleasant treatment from a math teacher?

*S:* If I summarized all the moments, when I was in elementary school, I often got pinched and was labelled as stupid student. When I was in junior high school, I often got mocked with

rude words from my math teacher. As I was in senior high school, I ever got pinched in my hands and my back.

I: Ok, thanks for your answer. So, it means that you often get those actions, right?

S: Yes, quite often

**Question 3. At what level did you experience the most bitter treatment by a math teacher?**

Unpleasant treatment by teachers generally occurred at all levels of education. However, most physical treatments took place at the elementary school level. It was observed that the physical treatment reduces as the level increases. However, other types of unpleasant treatment are more common, such as verbal, intimidating atmosphere, teaching methods, and teacher's integrity.

The researcher will present the sample of transcript during interview process.

I: At what level did you experience the most bitter treatment by a math teacher?

S: Based on my experience, I had a very bitter moment when I was in senior high school, because my math teacher often used rude words to me. One moment that I felt very depressed was when the teacher mentioned me as pig and stated that it was better for my parents to educate pig rather than me, as I told you before. It was very pathetic for me.

I: Are those statements disturbing you?

S: Personally, I felt very disturbed. Well, for me, I could still tolerate when my math teacher did some physical action. But when I was intimidated verbally, those kind of words would still be kept in my long-term memory.

**Question 4. How did bitter experience affect your view of mathematics then and now?**

The students' unpleasant experiences at school led to the same view of mathematics. They negatively view mathematics as a difficult subject, complicated, many calculations, not fun, lazy, less important (questioning material with real life), unattainable, abstract, boring, scary, and many tasks.

The researcher will present the sample of transcript during interview process.

I: How did bitter experience affect your view of mathematics then and now?

S: To be honest, I hate math so much when I entered junior high school. So, everytime I got a math lesson, the stigma that "I am exactly unable to do math" was frequently popped up in my mind

I: Can you tell us more specific about the stigma?

S: I mean that the stigma which are often echoing in my mind are like: "Math is difficult, complicated, contains of many calculation". So, I was intimidated by those stigma and those caused me to feel unable in doing math.

I: So, you experience math bitterness since the beginning of your study at junior high school?

S: Yes, I started to hate math since grade 7. I felt that the indication emerged in grade 7.

I: Then, how was your bitterness when you entered senior high school?

S: I started to hate math since I was in junior high school, but in senior high school, my dislike increased.

**Question 5. How has the bitter experience affected your view of yourself?**

Unpleasant experiences that lasted for a long period resulted to a negative view. Students see that they are incapable, not smart, weak, and resigned which led to insecurity.

The researcher will present the sample of transcript during interview process.

I: How has the bitter experience affected your view of yourself?

S: Yes, eventually the bitter experience caused me to see myself as a person who was really unable to do math.

I: Are you still looking up yourself like that until now?

S: Indeed. Until now, I still often say to myself that I am unable to do math, especially when I take Geometry course. Several times, I chat to my tutor to express my feeling. I often label with several words which tend to blame myself.

**Question 6. How did that bitter experience affect your view of math teachers in general?**

The students' answers were grouped into two under this question. The first highlighted the teacher's personality, in which the students viewed their math teacher as evil, rigid, hypocritical, considered a devil, and ordinary (without impression, without influence). The second emphasized the professionalism of teachers, in which the students viewed their teachers as monotonous (unattractive) in teaching. The monotonous mathematics teacher only gives continuous assignments as a way of teaching.

The researcher will present the sample of transcript during interview process.

I: How did that bitter experience affect your view of math teachers in general?

S: My worldview about math teacher is evil and rude. Because of that view, when I start my study in this campus, I decide to ask my roommate about my math lecturer, whether she is kind and friendly or not.

I: So, it means that you are afraid when the same condition occurs to you again?

S: Indeed. I really scare and worry.

**Question 7. How did this bitter experience affect your performance in mathematics?**

It was observed that the seven students had the same results, and their performance in mathematics was never good, often remedial, and only met the minimum completeness criteria or moderate.

The researcher will present the sample of transcript during interview process.

I: How did this bitter experience affect your performance in mathematics?



S: Well, I never got a good mark in math, because maybe I disliked math, and maybe because of all the treatments that I got from my previous math teachers. My math score always reached below 7.5 and never got higher than that. If I got good score at math, it because of my cheating during the math test. I was forced to do that because I was afraid of being gossiped by my classmates. So, I might do that to make I reached good score in math test.

**Question 8. What kind of bitterness persisted until now? Is it in the form of feeling depression, laziness in learning mathematics, indifferent attitude towards mathematics, or other forms (emotion or behavior)?**

The experience of unpleasant treatment over a long period has an impact on students to this day. It was observed that emotions that tend to be pessimistic or a feeling of incapability often arise whenever they re-encounter mathematics, are afraid of learning math, have dizziness, resentment, and hatred of math teachers, are nervous and afraid of exams, as well as depression (hard thinking). In addition to these emotions, it also affected students' behaviors, such as lazy learning.

The researcher will present the sample of transcript during interview process.

I: What kind of bitterness persisted until now? Is it in the form of feeling depression, laziness in learning mathematics, indifferent attitude towards mathematics, or other forms (emotion or behavior)?

S: The impact of my math bitterness was I became lazy student. I was overwhelmed if I was being bombarded with abundant task. It seemed like after I finished doing my task, suddenly there were another math task. I was really discourage because the more task I did, the more I got confused.

## **Discussion**

The results showed that the unpleasant treatment from teachers towards students includes physical, verbal, intimidating, learning methods, and teacher integrity. It was observed that the treatment incidentally and continuously has a short or long-term adverse effect on students. For example, intern teachers who continuously receive this treatment until they complete their education at the school level or college tend to experience long-term effects affecting students' academic performance. It is in line with the research conducted by [Baker-Henningham et al. \(2009\)](#) and [Mertoglu \(2015\)](#) that there is a correlation between unpleasant treatment that occurs in schools and students' learning achievement.

This experience often damages the students' perspective of the object (mathematics) and their math teacher and eventually affects their performances. Generally, a person is labeled as experiencing bitterness if he/she: 1) has experienced trauma ([Baures, 1996](#)), 2) has felt hate toward perpetrators ([Baures, 1996](#)), 3) feels they do not get what they deserve in life ([Poutvaara & Steinhardt, 2018](#)). Bitterness towards mathematics often arises when an individual:

1. Experienced unpleasant treatment from a mathematics teacher for a prolonged period

2. Has a negative view of mathematics
3. Feels untalented when it comes to mathematics
4. Views the mathematics teacher as unfriendly
5. Has poor performance in mathematics
6. Has high mathematical anxiety

Based on these indicators, *mathematical bitterness* was defined as a negative perception built from the accumulation of past experiences that affect the students' response to the subject and the teacher. This definition is based on the treatment factor of mathematics teachers at the school level, from elementary to secondary school grades.

Teachers are subjects that have the potential to create negative experiences for students in the aspect of math learning. It follows [Hayati and Ulya \(2018\)](#), who discovered that teachers often tell students that mathematics is complicated. [Hannula et al. \(2005\)](#) also argued that students' perceptions of mathematics tend to result in poor learning experiences aside from the teacher's treatment factor. [Gafoor and Kurukkan \(2015\)](#) found that the teacher's treatment factor was one of the significant reasons students disliked mathematics, and [Hannula et al. \(2005\)](#) stated that poor teaching experience, in addition to teacher's treatment, also affects students' perceptions of mathematics. Self-Determination Theory (SDT) also states that teacher motivation can indirectly influence student motivation through teaching practices that support the satisfaction of students' basic psychological needs ([Ahn et al., 2021](#)). It means that the teacher's treatment of students can affect their cognitive and psychological aspects. Psychologically, the closeness of the student-teacher relationship can help the student's self-efficacy ([Zee et al., 2017](#)).

A teacher's assessment of students' performance often affects their future academic results ([Zhu et al., 2018](#)). [Zhu et al. \(2018\)](#) further discovered that adverse treatment affected students' academic outcomes more broadly than positively. It is in line with the findings of [Anderman \(2002\)](#).

which states that individual students' perceptions of belonging were inversely related to depression, social rejection, and school problems. Based on these results, it was concluded that the teacher is an essential factor in influencing students' feelings, views, beliefs, attitudes, and emotions ([Scarpello, 2007](#)). It simply means that increasing teacher capacity is at the heart of the discourse on sustainable education reform ([Hallinger et al., 2021](#)).

The emerging mathematical bitterness regarding the teacher's treatment factor is a concern, particularly for prospective elementary school intern teachers, because they are figures that build the foundation, both in terms of student knowledge, character ([Kholifah, 2020](#)), and skills. It was observed that there was a relationship between teachers' enjoyment of teaching and their positive attitudes toward implementing instructional approaches in the classroom ([Trigwell, 2012](#)). [Russo et al. \(2020\)](#) also found that teachers' enjoyment positively impacts the teaching and classroom environment. Therefore, these prospective elementary school teachers expect to build a positive perception, admiration, and appreciation for mathematics to enjoy teaching and subsequently pass on favorable treatment to their students.

Generally, no discussion is found related to mathematics bitterness, particularly the issue caused by teachers' behavior. Until this far, recent studies have unfolded the students'

psychology phenomenon, which focuses on view, belief, conception, attitude, and emotion that supports or hinders their understanding of mathematics learning. Therefore, the study findings are expected to provide novel contributions to further mathematics education research.

## **Conclusion**

The indicators of students' mathematical bitterness in this study consisted of: (1) having experienced unpleasant treatment from a mathematics teacher for a prolonged period; (2) having a negative view of mathematics; (3) feelings of incapability in the subject of mathematics; (4) viewing the mathematics teacher as unfriendly; (5) poor performance in mathematics; and (6) having high mathematical anxiety. Therefore, the proposed mathematics bitterness definition is a negative perception of mathematics built from the accumulation of past experiences that affect the intern teachers' response to the subject and teacher.

When this bitterness is not resolved, it tends to persist and affect the readiness of intern teachers. It is therefore concluded that students with mathematical bitterness are unwilling to become mathematics teachers because they still feel unable to teach quite difficult materials and even become insecure while teaching.

The limitation is the number of subjects, which is only seven respondents; therefore, this study is not generally applicable. However, these results are expected to open up a discussion space for other studies to provide solutions for eliminating the student's mathematical bitterness. Teachers must be retrained on improving treatment during math classes to avoid bitterness. Further investigations must be conducted to provide solutions for intern teachers who experience mathematical bitterness due to teacher treatment factors. Intern teachers need to recover from their bitterness to be of good service to their students and help them appreciate, like, and realize the beauty and usefulness of mathematics in their lives.

## **Conflicts of Interest**

The authors declare no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancies, have been completed by the authors.

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## Author Contributions

**Kurnia Putri Sepdikasari Dirgantoro:** Conceptualization, writing - original draft, editing, and interviewer; **Robert Harry Soesanto:** Writing - review & editing, formal analysis, methodology, and interviewer; **Yanti:** Interviewer, coordinate with psychologist, validation, and supervision.

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