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Mathematical Bitterness Related to Teacher Treatment: A Preliminary Study on the Formulation of Indicators and Definitions in the Indonesia

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Abstract

Teachers are responsible for helping students to understand and admire subjects, which means they need to first 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 therefore intends to clarify the definition of mathematical bitterness and develop its indicators. The respondents were third-year students at Pelita Harapan University, Indonesia. Data were collected using questionnaires as well as interviews and was 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 important and relevant in everyday life because through this subject, an individual is able to 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 difficult subject, both by students and the wider community (Hayati & Ulya, 2018; Picker & Berry, 2000). Amirali (2010) discovered that most students around the world 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 caused the students not to enjoy the subject, have poor perceptions, and not able to see its usefulness in everyday life. This is consistent with Kargar et al. (2010) who stated that students with high mathematical anxiety tend to have low mathematical thinking scores and attitudes. This implies that students with mathematical anxiety need help for them to enjoy and feel the benefits of the subject. Scarpello (2007) identified that teachers are responsible for reducing math anxiety and also help students to deal with challenges while learning, therefore these teachers are expected to adopt effective learning practices.

Brandt & Chernoff (2015) discovered that the word "mathematics" raises various unpleasant memories due to past experiences, and one of which is influenced by teacher's treatment because not all are able to 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 has 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 & Ulya (2018) and Hannula et al. (2005), teachers' manners are strategies for attracting students' attention to mathematics. To achieve this goal, teachers need to 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 in terms of teacher's treatment from the previous school level.

Investigations about mathematical bitterness has not been specifically found, meanwhile several findings had examined the psychological phenomenon in students such as their views, beliefs, conceptions, attitudes, and emotions that either support or hinder the continuous mathematics learning (Hannula *et al*., 2005) (Kaasila *et al*., 2006). Larkin & 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 & Kurukkan (2015) further highlighted mathematics as a subject that evoked many negative emotions when students try to learn the subject. Larkin & Jorgensen (2015) discovered that students often express these negative emotions based on their feelings towards mathematics, such as hatred, boredom, frustration, and feelings of wanting to

cry every time they want to learn the subject.These motivated the exploration of potential bitterness towards mathematics among prospective elementary school intern teachers, particularly those who had been treated unpleasantly by their tutors.

Elementary School Teacher Education (PGSD) study program is for students who are going to work as elementary school teachers. Based on Law 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 need to be proficient in various subjects in order to fulfill professional competencebased on the Attachment Copy of the Minister of National Education Regulation Number 16 of 2007, which states that elementary school teachers are required to have the following core competencies:

"(1) Mastery of the material, structure, concept, and scientific mindset that supports the subjects, (2) Mastering the standards and basic competencies of the subjects/fields of development being taught, (3) Ability to creatively teach learning materials, (4) Develop professionalism in a sustainable manner by taking reflective actions, (5) Utilize information and communication technology (ICT) to communicate and develop themselves". It is important to note that the core competencies highlighted from number one to three are closely related to the subjects being taught. This implied that prospective elementary school teachers need to have qualifications in several major subjects, such as mathematics, Indonesian language, science, social studies, and Civics in order to perform their role as a tutor. Faridah et al. (2020) explained that professional competence in relation to 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 plan was the differences in teachers' beliefs and ideas about what they are capable of teaching. This is the reason Jacob et al. (2020) suggested that teachers need to have knowledge of content and pedagogical, because without this skill, students are likely to experience learning difficulties.

Therefore, this current study aims to build math bitterness indicators based on intern teachers' past experiences. A competent mathematical definition of bitterness was formulated with reference to 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

Design

This is a qualitative descriptive study with phenomenological approach used to provide an in-depth understanding of the phenomena experienced by individuals (Mitchell, 2018). Adams & van Manen (2017) also supported the selection of this phenomenological approach by deeply reflecting on the various meanings, orders, and feelings existing in humans. Interests have been developed to capture the phenomenon of bitterness toward mathematics learning that hit students based on mathematics teacher's treatment at their previous school. This interest has led to deeper study on this phenomenon in different stages by referring to Creswell (2014) as illustrated in Figure 1.

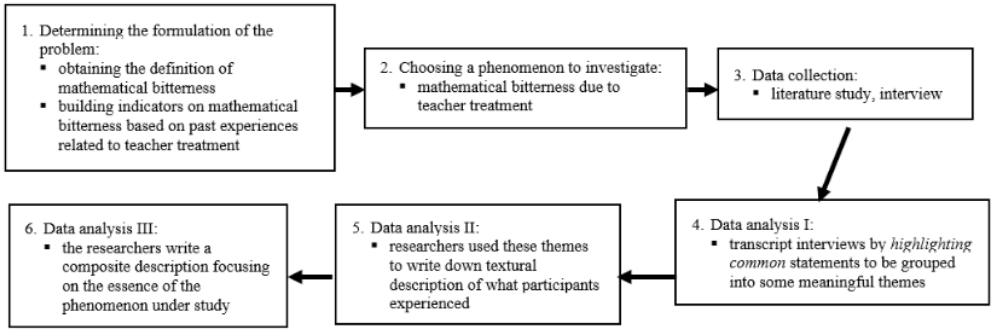

Figure 1. Diagram of phenomenological studies

Participants

A total of 34 intern teachers were selected to participate in this study using purposive sampling technique. These participants are PGSD students who are taking PSAP (Planning, Strategy, Assessment, and Learning) Elementary School Mathematics courses. In this course, intern teachers are guided and trained to be able to teach mathematics at the elementary school level, and were asked to fill out a questionnaire using the Microsoft Forms platform containing 5 questions of branching type. In the first question, students were asked about their preference for mathematics, of which there were only two choices, namely 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 next question which was 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 the past experience of teacher's treatment that has affected their performance.

It was observed from the questionnaire that 7 respondents, representing 46.67% disliked mathematics due to past experiences in the form of teacher's treatment factors. This number is certainly still 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 Collection Technique

Data were collected through semi-structured interviews conducted by the studyteam online and was recorded using Zoom Meeting application. Each subject was interviewed individually at different time, meanwhile the participants have been given the understanding to answer honestly and openly, prior to the interview. To provide a sense of security and comfort, the participants were assured that the results were treated confidentially. 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 these questions were validated by 3 experts before being used in interviews. The validation results are in the form of 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)?

The Technique of Data Analysis

After this interview, the seven students' video recordings were translated verbatim into transcripts accurately and was analyzed collaboratively by the studyteam to find important points (coding) in order to answer the problem statement. The analysis phase includes three stages (Creswell, 2014) as shown in Figure 1, 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 writing a composite description that focuses on the essence of the phenomenon being studied.

Results

The interview transcripts were analyzed and coded by each studyteam, afterward, the equating perceptions were discussed and analyzed in detail. The results of the analysis and coding conducted on the basis of the questions in the given semi-structured interviews are described below.

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.

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)'.
Physique	Pinching (stomach), throwing chalk at students, throwing erasers at students, and hitting the student's hand with a ruler.
Creating an intimidating atmosphere	Hitting a wooden ruler against the table, pounding the table, and throwing student books.
Teacher teaching method	Just give assignments, no explanation, and not focusing on teaching but telling life experiences.
Teacher integrity	Does not care about students, is only money-oriented; gets angry when students do not understand, and rarely attends class.

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.

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 of the physical treatment took place at the elementary school level. It was observed that the physical treatment reduces as the level increases, but other types of unpleasant treatment are more common, such as verbal, intimidating atmosphere, teaching methods, and teacher’s integrity.

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.

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.

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 personality of the teacher, in which the students viewed their math teacher as evil, rigid,

hypocritical, considered as 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.

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 KKM (minimum completeness criteria) or moderate.

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 an 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, afraid to learn math, dizziness, resentment and hatred of math teachers, 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.

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 have a short or long term negative effect on students. For example, intern teachers who continuously receive this treatment till they complete their education at school level or college tends to experience the long term effect.

This experience often damage the students' perspective of the object (mathematics) and their math teacher, and eventually affects their performances. Bitterness towards mathematics often arise 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, and 6) has high mathematical anxiety.

Based on these indicators, mathematical bitterness was defined as a negative perception that is 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. This is in accordance with Hayati & Ulya (2018) who discovered teachers often tell students that mathematics is a difficult subject. Hannula et al. (2005) also argued that students' perceptions of mathematics tend to result in poor learning experience aside the teacher's treatment factor. Gafoor & 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 affect

students' perceptions of mathematics. In fact, a teacher's assessment of students' performance often affect their future academic results (Zhu et al., 2018). Zhu et al. (2018) further discovered that negative treatment affected students' academic outcomes more broadly than positive. Based on these results, it was concluded that the teacher is an important factor in influencing the feelings, views, beliefs, attitudes, and emotions of students (Scarpello, 2007). This 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 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 teacher's enjoyment have many positive impacts on the teaching and classroom environment. It is therefore expected of these prospective elementary school teachers to build a positive perception, admiration, and appreciation for mathematics in order to enjoy teaching and subsequently pass on positive treatments to their students.

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 that is 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 who have mathematical bitterness are not willing to become mathematics teachers because they still feelunable to teach materials that are quite difficult, 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, it is expected that these results are able to open up a discussion space for other studies to provide solutions for eliminating the student's mathematical bitterness. Teachers need to be retrained on how to improve treatment during math classes to avoid bitterness. Further investigations have to be conducted to provide solutions for intern teachers who experience mathematical bitterness due to teacher's treatment factors. Intern teachers need to recover from their bitterness in order to be of good service to their students and to help them appreciate, like, and realize the beauty and usefulness of mathematics in their lives.

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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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