Managing Students Mathematical Anxiety through a Bugis-Makassar Culture-Based Learning Model

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Abstract. This article is a literature review that is presented descriptively. The purpose of this study is to illustrate how to manage students' anxiety towards mathematics (math-anxiety) through learning models based on Bugis-Makassar Culture (BMC). The correct management of students’ math-anxiety by the teacher can have a positive impact on student learning outcomes, while unprofessional management can increase student math-anxiety. One of the steps that can be taken by the teacher to reduce students' math-anxiety is to use a mathematical learning model based on the BMC in mathematics learning. There are 4 phases, namely: (1) information, motivation, and apperceptions; (2) construction of mathematical concepts and principles through discussion; (3) group presentation; and (4) classical presentation. There are 4 aspects in BMC which can be implemented in the learning activity, namely siri’, abbulo sibatang, sipakatau, and pacce. These four aspects that are implemented in this learning activity aimed reducing students' math-anxiety.

1. Introduction

Mathematics has an important role in various fields, but many people assume that mathematics is one branch of science that is difficult to understand [1]. This wrong perception about math can potentially trigger anxiety toward mathematics. This anxiety can begin as a child which continues until the child becomes a teenager, even after becoming a parent. There have been many research results that indicate a negative correlation between math-anxiety and student achievement. On the other hand, students who have never had math-anxiety are also at risk of being less motivated in learning. Therefore, the teacher must manage students' math-anxiety correctly [2].

There are many factors that influence students' math-anxiety [3]. This math-anxiety can come from the teacher, parents, classmates, and the students themselves. Authoritarian teachers can cause students to worry too much [4]. Parents who are too demanding of their sons and daughters to have high achievements in mathematics also trigger math-anxiety. Classmates who like to bully can also be a cause.

Given that math-anxiety is closely related to student character, character education is needed to help teachers manage math-anxiety. There are various cultural values that can be explored to develop learning activities that are able to improve the character of the nation's children [5]. One of the cultures in Indonesia that can be used to develop student character is Bugis-Makassar Culture (BMC) [6].
Based on this rational, researchers are interested in reviewing Mathematics learning models based on Bugis-Makassar Culture. This study is important to do because it is directly related to student character education. Through proper character education it is expected that teachers can manage students' math-anxiety.

Based on the nature and function of this learning model, the teacher, peer tutors or parents of students can fulfill their respective roles in motivating students who suffer from math-anxiety. Furthermore, the four aspects that this learning model has, namely *siri*, *abbulo sibatang*, *sipakatau*, and *pacce* are the basis for carrying out learning activities. For example, in the *abbulo sibatang* aspect which means brotherhood, peer tutoring has the role of helping their friends who have difficulty in the learning process of mathematics in class [7, 8]. Thus, this article will focus on discussing "How to Manage Students' Mathematical Anxiety through a Mathematical Learning Model based on Bugis-Makassar Culture?"

2. Method

This article is a literature review that is presented descriptively. The purpose of this study is to illustrate how to manage students' anxiety towards mathematics (math-anxiety) through learning models based on Bugis-Makassar Culture (BMC).

3. Result and Discussion

3.1. Mathematical Anxiety

Hembree [9], Oltmanns, Thomas F, Emery & Robert [10] state that anxiety is characterized by abnormal levels of emotions so that the response-stimulus for the surrounding situation becomes excessive and difficult to overcome. Then it was clarified by Anita [11] that anxiety is the emergence of tension, insecurity, and worries that nest in the sufferer of something that makes him uncomfortable.

Ashcraft [12] and Paul [13] argue that math-anxiety is characterized by excessive fear of numbers, problems, or mathematical questions, or other things related to mathematics. This fear can be caused by students' mistaken perception that mathematics is a difficult lesson to understand. Based on some opinions about math-anxiety, it can be concluded that math-anxiety is characterized by feelings of worry, fear or anxiety about math subjects.

Math-anxiety, if not handled properly, can adversely affect student learning outcomes. A number of the results of the following studies corroborate the importance of math-anxiety handled well.

| Ref. | Year | Title | Author | Subject | Correlation |
|------|------|-------|--------|---------|-------------|
| [14] | 2007 | The Effects of Mathematics Anxiety on Matriculation Students as Related to Motivation and Achievement | Effandi Zakaria and Norazah Mohd Nordin | 88 students: 73 women and 15 men | -.72 |
| [15] | 2012 | The Impact of Mathematics Anxiety on Primary School Children’s Working Memory. | Marcus Witt | 55 students: 18 men and 37 women | -.359 |
| [11] | 2014 | Pengaruh Kecemasan Matematika (Mathematics Anxiety) Terhadap Kemampuan Koneksi Matematis Siswa SMP. | Ika Wahyu Anita | 80 students VII grade Public Middle School in Bandung | -.903 |
Table 1. Continuation. Research of Correlation between Math-Anxiety and Student Learning Achievement

| Ref. | Year | Title                                                                 | Author                                                                 | Subject                                                                 | Correlation |
|------|------|----------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------|-------------|
| [16] | 2016 | On the relationship between math anxiety and math achievement in early elementary school: The role of problem solving strategies | Gerardo Ramirez, Hyesang Chang, Erin A. Maloney, Susan C. Levine, Sian L. Beilock | 256 students in the first class (139 women) and 308 children in the second class (167 women). | -.36        |
| [17] | 2017 | Analisis Faktor Tingkat Kecemasan, Motivasi Dan Prestasi Belajar Mahasiswa | Sri Adi Widodo, Laelasari, Ryky Mandar Sari, Ian Rosita Dewi Nur, dan Flora Grace Putrianti | 125 students | -.018      |
| [18] | 2018 | A Meta-Analysis of the Relationship between Anxiety toward Mathematics and Achievement in Mathematics | Xin Ma | 18 published articles, 3 unpublished articles and 5 dissertations. | -.27        |
| [19] | 2018 | Pengaruh Kecemasan Matematika (Mathematics Anxiety) terhadap Hasil Belajar Matematika Siswa SMP | Tatiana, Nerru Pranuta Murnaka, dan Wiwik Wiyanti | Grade VIII students totaling 188 students | -.143       |

Based on Table 1 it can be seen that the negative correlation between math-anxiety and mathematics learning outcomes ranged from -0.0118 to -0.903. This is what reinforces the reason for the need for math-anxiety well managed by mathematics teachers.

3.2 Mathematics learning model based on Bugis-Makassar Culture

According to Muhsetyo [20] mathematics teaching and learning is a teaching and learning activity in the classroom that studies mathematics with the aim of building students' mathematical abilities. Whereas according to Ernest [21] mathematics learning is a process that is deliberately designed with the aim of forming space and time that allows a person (student) to carry out the process of learning mathematics, and students learn mathematics to try and find experiences about mathematics. Based on several studies on the definition of learning mathematics, in this article, it can be concluded that mathematics learning is an activity to help students find deductive mindsets in learning a number of concepts, principles and problem-solving related to mathematics.

According to Akib [7] the mathematical learning model based on Bugis-Makassar Culture (BMC Model) is a conceptual framework or pattern that describes systematic procedures in reconstructing mathematical learning experiences based on Bugis-Makassar Culture to achieve certain goals. This particular learning goals/objective serves as a guide for mathematics teachers in planning and
implementing mathematics teaching and learning activities. According to Akib [7], following are the learning steps/phase using BBC Model and the cultural aspects that can be applied in every phase.

**Figure 1. Syntax Diagram of Mathematical Learning Model based on the BMC Model [7]**

*Siri’* in the Bugis cultural system is the defense of moral pride and law and religion as one of the main values that influence and colour the nature of thoughts, feelings and human will. *Pacce*, literally means feeling sad because you see the suffering of others. This feeling serves as a tool to promote unity, solidarity, togetherness, loyalty and a sense of humanity. *Abbulo sibatang* spirit contains a high sense of solidarity to help each other in facing challenges. This sense of solidarity accompanied by a spirit of mutual respect is called *sipakatau* [7].

The explanation for each phase of learning is as follows. In the first phase, which is about information, motivation, and apperception, the teacher carries out a series of activities in the classroom. These activities are: (1) conveying information about the material to be taught; (2) provide motivation to students in the form of support and reinforcement to reduce students’ math anxiety; (3) foster students’ confidence in learning; and (4) giving an apperception at the beginning of mathematics learning so that students recall the concepts that have been learned. In this phase, the teacher can incorporate the culture aspects *siri’* by directing students to grow their self-esteem so that they avoid violations. Then, the teacher can also incorporate the culture aspects *sipakatau* by giving advice that is motivating students to be enthusiastic in attending the lesson.

In the second phase, which is about the construction of mathematical concepts and principles, the teacher helps students discover mathematical concepts and teach mathematical principles through a process of discussion in class. The discussion was conducted by dividing the class into a number of groups consisting of 5-6 heterogeneous students. In each group, there are students who are appointed as group leaders. During this discussion, the teacher acts as a moderator who directs all groups during the discussion process. In this phase, the teacher can incorporate the culture aspects *siri’* by giving students the opportunity to maintain their group’s self-esteem according to their respective roles. The teacher can also incorporate the culture aspects *abbulo sibatang* through the responsibilities of each group that has been formed to work together. The teacher can also include the culture aspects *sipakatau* by reminding students about the rules of discussion, topics of discussion and others. The teacher can also incorporate
the culture aspects pacce by giving each group the opportunity to solve problems during the discussion process.

In the third phase, which is about group presentation, the teacher as the moderator has the role of managing all groups to remain active during the discussion process. In this phase, the teacher can incorporate the culture aspects siri' through a discussion process that activates students so that students feel embarrassed if they do not answer the questions of other students in the discussion. This shame can be considered part of self-esteem. Teachers can also incorporate the culture aspects abbulo sibatang through the role of group to defend each other's opinions or teach each other between group member. In this phase, the group leader acts as a peer tutor and is in charge of controlling his group. Furthermore, the teacher can incorporate the culture aspects sipakatau by giving an opportunity to each group to present the results of the discussion while providing an opportunity for other groups to ask questions. The teacher can also incorporate the culture aspects pacce by instilling the social spirit of each student to foster a sense of empathy for students so that the desire arises to help each other.

In the fourth phase, namely classical presentation, the teacher as the moderator concludes the results of the discussion then determines the acquisition of scores from each group to get the best group predicate. The best groups are given prizes, while the other groups are given reinforcement to be able to study harder. In this phase, the teacher can incorporate the culture aspects siri by motivating other groups to be more active in the learning process. The teacher can also incorporate the culture aspects abbulo sibatang by directing students to respect each other. Then the teacher can incorporate the culture aspects sipakatau by giving gifts to the best groups and giving motivation to learn to the other groups. The teacher can also incorporate the culture aspects pacce by directing each group to strengthen each other.

3.3 Managing Students Math-Anxiety through Mathematical Learning Model Based on BMC

The results of Ma'rub's research [8] concluded that students' responses to mathematics learning based on BMC were good. This good response can be used as capital to increase student learning motivation and reduce math-anxiety. Referring to the mathematical learning concept based on BMC from Akiib [7] it can be illustrated the link between the learning phase which contains aspects of BMC and reducing of student math-anxiety as follows.

In the first phase, the existence of information, motivation, and apperceptions designed by the teacher to incorporate aspects of the siri’ culture can make students more confident, motivated, and better prepared to take lessons. This self-confidence, motivated, and better prepared has the potential to reduce math-anxiety students. Therefore the teacher must prepare the initial activities of this learning seriously.

In the second phase, by involving students more in discovering mathematical concepts or principles through directed discussion, and by including aspects of the siri’ culture and abbulo sibatang spirit can reduce students math-anxiety. This can be realized if the teacher is able to classify students appropriately, able to direct students to help each other and be responsible for the success of the group, and able to control their emotions. The control of teacher emotions becomes important in reducing student math-anxiety [2]. Relationships between students who are good during the discussion process can reduce math-anxiety students.

In the third and fourth phases, namely group discussions and class presentations, by incorporating aspects of the siri’ culture, the spirit of abbulo sibatang, and the cultural aspects sipakatau and pacce will reduce student math-anxiety. The essence of these aspects of culture is the spirit of mutual help, mutual respect, and empathy for one another. With such enthusiasm students can learn more comfortably in class.

In summary, the relationship between Learning Model based on BMC and reducing Math-Anxiety can be described as follows.
### Table 2. The Relationship between Learning Model based on BMC and reducing Math-Anxiety

| Phase | Activities in Learning Model based on BMC | Relation to the management of student math-anxiety |
|-------|-------------------------------------------|---------------------------------------------------|
| 1.    | The teacher gives Information, motivation, and apperceptions | The students are more confident, motivated, and better prepared to take lessons. |
| 2.    | The students discuss to obtain mathematical concepts and principles with the help of teachers and friends in their groups. | The students feel less anxious because the construction of mathematical concepts and principles is done through the group discussions. |
| 3.    | The students in each group convey what they have and have not understood. More understanding group members explain to other group members. | The students do not feel anxious in group discussions because of the spirit of mutual respect for the opinions of other friends |
| 4.    | There is a presentation in front of the class. Other students observe and correct the presentation with enthusiasm. The teacher gives reinforcement and motivation. | The students decrease their anxiety because of their empathetic friends and teachers who provide reinforcement and motivation. |

Basically, the teacher must continue to strive so that students learn mathematics without excessive anxiety. Regarding the *siri*’ culture that exists in Bugis society, the teacher should never make students shy/embarrassed in front of the class. Self-esteem is very important for the Bugis community. Therefore, stepping on student self-esteem can result in increased anxiety.

### 4. Conclusion

The Mathematics Learning Model based on BMC consists of 4 phases, namely: (1) information, motivation, and apperceptions; (2) construction of mathematical concepts and principles through discussion; (3) group presentation; and (4) classical presentation. At each phase can be included aspects of Bugis-Makassar Culture (BMC), namely *siri*’ which means self-esteem, *abullo sibatang* which means a high sense of solidarity, *sikapatau* means mutual respect, and *pace* which means empathy.

To help the math teacher manage students math-anxiety according to Bugis-Makassar culture-based learning, it is recommended that teachers: (1) never embarrass students in front of other students; (2) building healthy and harmonious relationships between students and teachers; (3) giving direction to students to learn from mistakes when working on problems; (4) encourage students not to give up easily; and (5) train students to be able to help other students who are experiencing difficulties.

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