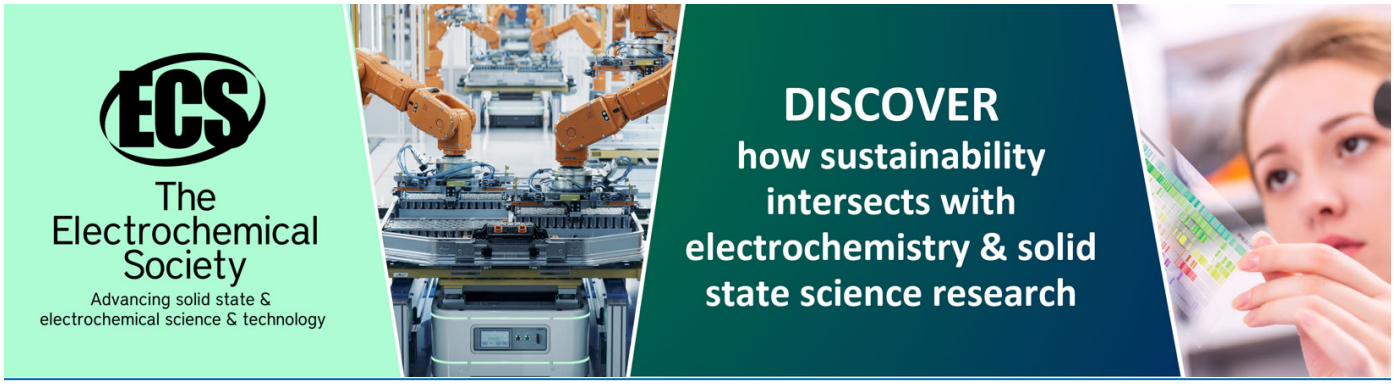
# Ethnomathematics: humanistic learning to manage math anxiety





# Ethnomathematics: humanistic learning to manage math anxiety

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**Abstract.** Anxiety is one of someone emotion. Math anxiety will make a negative effect on student personality. Of course, this problem should not be left, because it will make a bad impact for next generation. One of learning approach that can manage math anxiety is by learning which regard the human side. Mathematical learning that regarding the human side of the student is called humanistic mathematical learning. This learning is recommended to make students enjoy in learning and pay more attention to their existence as humans in their learning environment. The school with strong tribal customs has problems in delivering material. Language is a major obstacle in delivering material. Furthermore, educators must use the local language to teach mathematics, it's called ethnomathematics. Ethnomathematics appear as a bridge between formal mathematics and concrete mathematics around student culture. With ethnomathematics, students will be easier and more enjoyable when learning mathematics because the material is directly related to their culture in daily life. Therefore, ethnomathematics learning can help the teacher to manage math anxiety.

## 1. Introduction

A common problem in learning mathematics is math anxiety. Anxiety is the reason for someone to refuse mathematics. It happens because anxiety is subjective and affects individual difficult in understanding mathematics. Math anxiety is commonly defined as a feeling of tension, apprehension, or fear that interferes with math performance [1]. This is in line with the opinion Wahid [2] that math anxiety is situations that happen to someone when facing a mathematics problem. The thing that supports "mathematics is scared" is people assumed that mathematics is only memorizing formulas so that it's difficult to understand. Furthermore, studying mathematics that means higher order thinking, too much practice, and using abstract symbols, will increase student's anxiety in learning mathematics.

Math anxiety will hinder mathematics development in the future of the students. Therefore, to reduce math anxiety can be used learning that pays attention to the human sides' of students. Learning that pays attention to the human side of students is often called humanistic learning. The human sides that must be considered are the psychological and socio-cultural environment. In the learning process, educators are required to understand the background and psychological conditions of different students so that the objectives of the learning can be achieved. The psychological condition of students is very diverse. Several things that need to be considered so learning can be received by students are the conditions in which students feel comfortable, feel safe, feel cared for, feel equal, etc. This agrees with Bell and Schniedewind [3] that said humanistic educators must work with conscious mental processes and stress the benefit integrating the emotions to the learning process rather than emphasize the unconscious and emotional interference with student cognition. Therefore, educators

have required pay attention to the psychological conditions of the students so that students comfortable in learning.

It has explained that humanistic learning is learning that pays attention to the human side of students seen from various aspects, one of them is social aspects. School that in an environment with certain customs and tribes are often obstacle for educators in delivering materials. Language is an obstacle in the delivery of learning material. In case, many parts of Indonesian school use their respective regional languages. Therefore, educators must be use the local language to teach mathematics. This agrees with Hiebert & Capenter [4] statement that the formal mathematics and the mathematics that children find in their daily lives are very different. Therefore, it's needed a bridge between formal mathematics and children's mathematics based on the socio-cultural environment of each student. One of learning based on social environment is ethnomathematics approach. According to Gerdes [5], ethnomathematics is mathematics that applied by a group of people with certain cultures, certain classes, professional classes, etc. Therefore, it is necessary to study that ethnomathematics can manage student's anxiety in learning mathematics.

The aim of this article is to discuss the role of ethnomathematics in managing students' math anxiety. Not only a bridge between concrete mathematics and formal mathematics, but also ethnomathematics is expected to be a fun learning. So, math anxiety will be managed by fun learning and the goal of learning mathematics will be achieved.

## 2. Method

This article using literature review method about knowledge, ideas, or findings contained in the literature. So that it can provide theoretical and scientific information related to ethnomathematics approaches in managing math anxiety. Data were collected and analyzed in the form of literature learning anxiety and ethnomathematics. In this article, we will exemplify some mathematical concepts using ethnomathematics approaches so that math anxiety can be managed. Data is obtained from scientific journals and some author experiences. Data analysis techniques are carried out in several steps. The first step is collecting literature on ethnomathematics and math anxiety. The second step is reducing existing data and chooses ideas about the use of ethnomathematics approach in managing math anxiety. The third step, the author identified the use of ethnomathematics approach in managing math anxiety. After believe that ethnomathematics can manage math anxiety. Finally, the last step is the authors conclude that math anxiety can be managed with ethnomathematics.

## 3. Result and Discussion

### *3.1. Math Anxiety*

Many forms of students' feelings when the math exam. Some of them are feeling tense, nervous, unpleasant, and even scared. It causes the mentally of the students are not prepared to deal with the mathematics exam. On the other side, students assume that the results of the exam will affect their social life, especially the judgment from others. For example, students will be embarrassed when they get poor grades or get grades that were far from expectations, so students become less confident. Feeling tense, nervous, unpleasant, scared when a faced mathematical problem is called math anxiety.

Many researchers define mathematical anxiety in various perspectives. According to Vinson [6], mathematical anxiety can be implemented more than disliking mathematics. In addition, Trujillo and Hadfield [7] explain a state of discomfort that occurs in responding to situations involving mathematical tasks that are considered a threat to self-esteem. This statement is also supported by Al-Hoda [8] that math anxiety is a psychological status, which comes to people when dealing with mathematical content in learning and teaching situation in solving mathematics problems and assessing mathematics behavior. Some researchers argue that math anxiety can be seen as a "disease". Luo, et al [9] say that Physiological reactions such as tight fists, sweaty palms, being sick, dry lips, vomiting, and a pale face can also occur potentially resulting in students losing not only their interest in mathematics but also their confidence learning mathematics. From this definition, it can be

concluded that math anxiety is a form of the individual feeling of fear, tension, and lack of confidence or anxiety in the process of learning mathematics with various forms of psychic reactions.

Math anxiety will make negative affect of student personality. This resulted in decreased student confidence with math problems. Of course, this problem should not be left, because it will make a bad impact on the young generation. According to Christie Blazer [10], the teacher's technique in reducing students' mathematics learning anxiety are below.

- Develop a positive attitude toward mathematics
  Teachers are advised to attend workshops on best teaching practice research to teach mathematics and become more aware of the effects of mathematical anxiety by reading related literature and attending conferences on the topic of math anxiety. Teachers must also relate to each other to discuss problems and ideas about math anxiety
- Connect mathematics with real life
  The teacher must make mathematics relevant to students' lives and make connections to everyday applications, such as counting changes and going shopping, to help students realize that mathematics is important and useful
- Give encouragement to active learning
  Studies have found that the best students in learning mathematics when they are active rather than passive students. Students must be involved in exploring, thinking, practicing, and using knowledge rather than listening to descriptions of verbal concepts. Teachers are advised to enter games and activities into mathematics so they have experience in mathematics by they self.
- Accommodate a diverse learning style of students
  Teachers can help students overcome math anxiety by accommodating a variety of learning styles in their classrooms and modifying their teaching practices to ensure that all students experience mathematical success. For example, new mathematical concepts can be taught through visual aids, discussion, acting, and direct activities
- Perform cooperative learning
  Cooperative learning provides opportunities for students to exchange ideas, ask questions freely, express their opinions, justify their answers, and debate their thought processes

### *3.2 Humanistic Learning*

In general, learning is a process of interaction that occurs between educators, students, learning environments and certain sources of knowledge. It can be interpreted as a process whereby a teacher assists students in gaining certain knowledge in the school to achieve the goals of learning called competency standards. In the learning process, educators are required to understand the background and psychological conditions of students, so the objectives of learning can be achieved. In general, the psychological condition of students is very diverse, but there are saveral things that need to be considered so that learning can be received by students. These psychological conditions are feeling comfortable, feeling safe, feeling cared for, feeling equal, etc. Therefore, educators are required to pay attention to the psychological conditions of the students so that students can learn comfortable. Learning that take care the psychological condition of students is often called humanistic learning.

Basically, humanistic learning is learning that humanizes humans. It means this learning take care into many aspects of humans. The human aspect that is meant in this condition is the relationship between the performance of one's thoughts and feelings in the learning process. This agrees with Bell and Schniedewind [3] which states that humanistic educators must work with conscious mental processes and emphasize the benefits of integrating emotions into the learning process rather than emphasizing subconscious and emotional disturbances with cognition.

Based on this view, Soemanto [11] said that there were humanistic learning principles expressed by Roger through his book entitled "Freedom to Learn" as follows:

- Humans have the ability to learn naturally.
- Significant learning occurs when students have relevance to their own intentions.

- Learning that involves a change in student perceptions is considered a threat and will tend to be rejected by students.
- Learning tasks that threaten him will be more easily felt and assimilated if the threat from outside becomes smaller.
- If the threat to students is low, the experience can be obtained in different ways and learning takes place.
- Meaningful learning will be obtained by students by doing it.
- Learning will be carried out if students are involved in the learning process and take responsibility in the learning process.
- Learning at the initiative of the students themselves which involves the whole student's personalities, both feelings, and intellect, are a way of acquiring deep knowledge.
- With confidence in themselves, creativity will be more easily achieved if students are accustomed to self-introspection and assessment of others is important.
- The most useful learning now is learning about the learning process, an ongoing openness to one's own experience and awareness of change in itself.

From the above principles, we can know the characteristics of humanistic mathematics learning such as the opinion of Haglund [12] as follows:

- Placing students as inventors (inquirers) not only recipients of facts and procedures
- Give students the opportunity to help each other in understanding the problems and solutions that are more profound
- Learn various ways to solve problems, not only with the algebraic approach
- Shows the historical background that mathematics as an invention or endeavor from a human being
- Using interesting problems and open-ended questions is not just exercises
- Using a variety of assessment techniques not only assess students based on the ability to remember procedures only
- Develop an understanding and appreciation of the great mathematical ideas that shape history and culture
- Helping students see mathematics as a study of patterns, including aspects of beauty and creativity
- Helping students develop self-confident, independent and curious attitudes (curiosity)
- Teaching materials that can be used in everyday life, such as in science, business, economics, or engineering.

From the principles expressed by Roger and the characteristics revealed by Haglund, it can be concluded that mathematics learning will occur humanistic if the educator treats students humanely. This is certainly not easy for educators because educators must fully understand the character of each student and determine a learning model that can be accepted by students.

*3.3 Ethnomathematics*

Culture-based learning is a learning approach that prioritizes student activities with a variety of specific cultural backgrounds around the school. According to Wahyuni [13], culture-based learning can be divided into three types: learning with culture, learning about the culture, and learning through culture. Culture-based learning more emphasizes on achieving an integrated understanding rather than just a deep understanding. In culture-based learning, culture can be a bridge between formal mathematics and concrete mathematics based on the socio-cultural environment of each student. Therefore, students will be easier to receive the knowledge given by the teacher. One form of culture-based learning is ethnomathematics.

Ethnomathematics was introduced by a Brazilian mathematician name D'Ambrosio. Cited from Rossa and Orey [14], D'Ambrosio defines ethnomathematics as language, the prefix "ethno" is defined as a broad perspective that refers to the socio-cultural context, including language, jargon,

code of behavior, myths, and symbols. The basic word "mathema" tends to mean explaining, knowing, understanding, and carrying out activities such as coding, measuring, classifying, concluding, and modeling. The suffix "tics" comes from techne, and means the same as technique. Whereas in terms D'Ambrosio [15] defined it as mathematics is practiced among identifiable cultural groups such as tribal-national communities, labor groups, children from certain age brackets and professional classes.Then this term was refined to I have been using the wordethnomathematics as modes, styles, and techniques (tics) of explanation, of understanding, and ofcoping with the natural and cultural environment (mathema) in distinct cultural systems (ethno) [16].

Ethnomathematics includes mathematical ideas, thoughts, and practices developed by culture [17]. Ethnomathematics can also be interpreted as a learning approach that aims to learn how students understand, articulate, process, and ultimately students can use mathematical ideas and concepts in solving problems in their daily lives. This is also explained by D'Ambrosio [15] who says that ethnomathematics is the study of mathematics which considers the culture in which mathematics emerges by understanding the reasoning of the mathematical system they have used. Ethnomathematics is a bridge between formal mathematics and culture. As already explained that with ethnomathematics, there are different ways applying mathematic in daily life. By applying ethnomathematics as a learning approach, a material will be well received by students. This is because the material that is learned related to culture will be more easily accepted because the material is directly related to a culture which is their daily life. Therefore, this culture-based learning will help teachers in facilitating students in learning mathematics.

Here are some applications of ethnomathematics in mathematics learning. Research conducted by Supriadi [18] on $6^{th}$-grade students in the use of sticks in multiplication operations. Students were taught how to use the sticks in solving mathematical problems so that students can easily solve number multiplication operations. The results of this study are students become happier in learning because the teacher uses the media around the students. Therefore, students become easier to understand the material delivered by the teacher. Another example of the application of ethnomathematics is the research conducted by Supriatna and Nurcahyono [19] on farming activities using mathematical concepts. From the results of his research, not only mathematical concepts that can be applied in the field of agriculture but in mathematics, subjects can also use farming activities in learning. The stages of farming used in mathematics learning are as follows:

- The concept of comparison in the land processing stage.
- The concept of numbers in the seed selection stage
- The concept of integer operation in the process of seed maintenance and planting
- Statistical concepts in the harvest process

Ethnomathematics learning activities will be more fun, reduce anxiety about mathematics, and understanding the material by students also become better. Ethnomathematics can be a way of introducing and preserving culture.

### *3.4 The relations between anxiety and Ethnomathematics*

The relation between anxieties in learning and ethnomathematics is explained in the Figure 1 below.

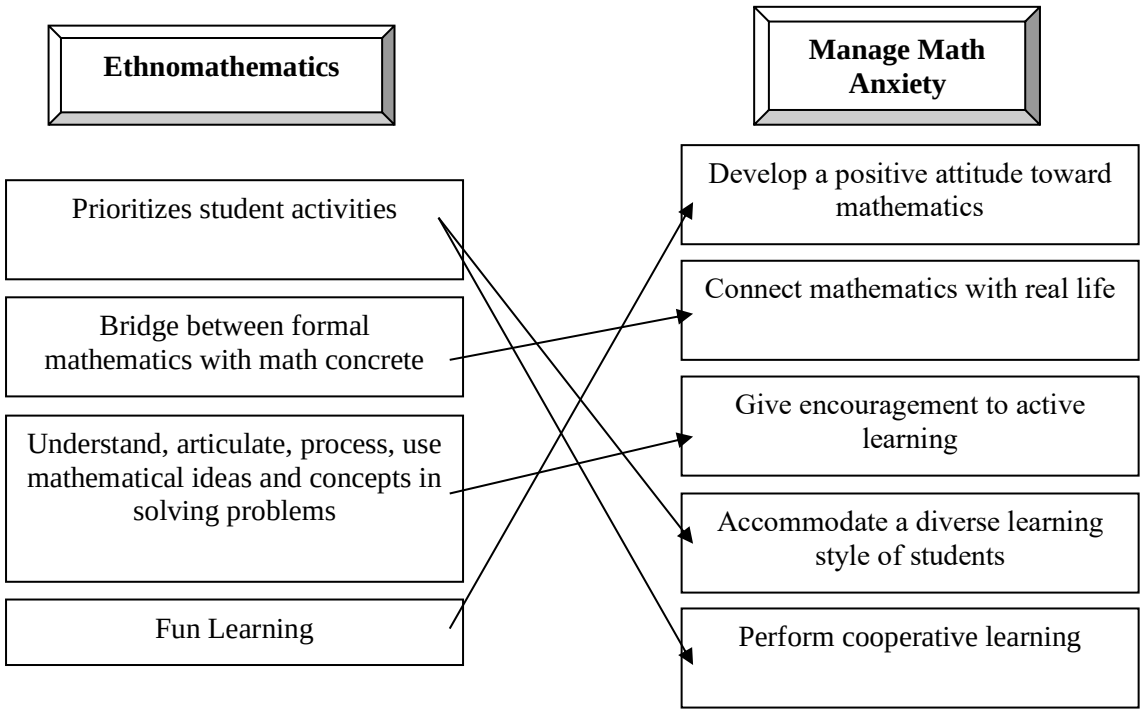


**Figure 1.** The relations between anxiety of learning and ethnomathematics

## 4. Conclusions

Reducing math anxiety is a hard job for the teacher. Thelearning strategy that can change the children's perception of math, from math is scary into math is fun. Nowadays, many learning strategies are fun for students. One of them is learning by paying attention to the human sides' of students or often known as humanistic learning. The human sides' is the synchronization between the brain and emotional performance of the learning process. Humanistic learning can be implemented into learning with an ethnomathematics approach. Furthermore, with an ethnomathematics approach, teachers are able to introduce mathematics through certain cultural customs. Then, students will be easier and happier in learning mathematics because the material is directly related to a culture which is their daily life. Therefore, this culture-based learning will help the teacher in managing math anxiety.

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