Can Sociomathematical Norms Be Developed With Learning Media?

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Abstract. The purpose of this article shows that sociomathematical norms can be raised through learning media. Sociomathematical norms are social norms related to problem-solving in mathematics learning. Sociomathematical norms can be formed from interactions between students or teachers in learning mathematics so that the culture of mathematics can be formed in a group or the class community at school. This preliminary study is not to create learning media that can improve the norms of sociomathematical but can only utilize conceptual by comparing various literature related to social norms, sociomathematical norms, and learning media. Theoretically, using visual media can improve sociomathematical norms, so that mathematical culture in the class can be formed. This is because visual learning media can be used by students to interact with the surrounding environment. In this regard, the teacher needs to prepare visual learning media to help mathematics learning so that the mathematics culture in the class can be formed.

1. Introduction

Social interaction becomes one of the main concerns of constructivist social understanding. Constructivism social notion holds that the cognitive development of an individual is a result of communication in social groups that cannot be separated from everyday life, the learning process of an individual is not only independent, in the sense of being done individually but also a form Social activities that go together [1]. This is in line with Vygotsky as one of the social adherents of constructivism to emphasize the importance of social interaction as a prerequisite for individual cognitive development through the internalization of ideas in a community [2].

Social interactions can be done among others by optimizing communication. Communication is an important part of mathematics and mathematics education, referring to a constructivist view which states that the cognitive development of an individual is a result of mathematical communication in the group of questions that cannot be separated in everyday life [3], even communication is one of Five processes emphasized by National of Council Teacher of Mathematics [4,5]. Communication, in this case, is a mathematical communication between students and students and between students and teachers. Through communication activities, students can exchange ideas and opinions, clarify their understanding and knowledge, and so on [6,7].

In addition to problem-solving skill, the ability that every individual must have as a social being is social intelligence. The social intelligence possessed by each is obtained as a result of an interaction between students and students with the teacher. Social interaction is closely related to the negotiation of
procedures for solving problems, especially in mathematics learning. The process of negotiation that occurs from a norm or rule of the so-called sociomathematical norms. So that with the sociomathematical norms of social intelligence possessed by each can be developed. The sociomathematical norm is closely linked to negotiations on what is called problem-solving procedures, about what sort of problem-solving procedures are acceptable, about alternative procedures and also on effective procedure formulation. Sociomathematical norms are formed when explanations and justifications are made acceptable.

Sociomathematical norm, which is formed from the process of interaction, both interaction between students and the interaction between students and teachers in mathematics learning, are expected to form a mathematics class culture [8]. With the culture of the class formed, the problems that have emerged as in the city in Yogyakarta can be minimized. Klithi is a group of people (a type of motorcycle gang) who find work by creating problems, such as hurting other people even though the other person does not make mistakes with the group members, the age of the perpetrator is usually still in their teens or school-age [9]. Also, Sociomathematical norms have a positive impact on improving academic achievement. Sociomathematical norms also play a role in the development of student personality [10]. Unwittingly during the learning process, teachers and students have used sociomathematical norms such as leading students to ask questions and argue during the learning process, creating a creative and innovative learning atmosphere, accompanied by using learning methods that help students become more active [8]. The problem so far is that mathematics learning only focuses on classroom learning and research conducted in the classroom [11]. Based on this, the main purpose of this paper is to examine theoretically those related to the social norms of mathematics in learning mathematics using visual media.

2. Method
This research is a preliminary study and does not intend to create a research product or test the effectiveness of a learning model. This research is a preliminary study conducted with a conceptual approach before the development of a research product. This preliminary study is part of a Four-D research method that aims to develop learning media products. Four-D research method there are define, design, develop, and dissemination [12].

This study is a preliminary study of the Four-D stage, the method used is grounded theory which is carried out by reviewing the literature relating to capacity to solve mathematical problems, sociomathematical norms, and visual media from supporting journals or books.

3. Result and Discussion
3.1. Sociomathematical Norms
Mathematics class is a miniature society, various characters that brought students from outside the class to give color in the process of student interaction in the class [13]. So that learning in math class will bring up many problems. This is due to the habits of students who vary from one to another. So that the learning of mathematics must be able to organize the diversity of student habits so that the process of achieving the learning objectives is not disturbed. Social interaction with the environment can help teachers and students to create effective learning because teachers can understand the diversity of habits held by students.

By interacting, both the interaction between students and students with teachers can be used as one of the strategies to solve problems, especially on mathematical problems. Social interaction in solving mathematical problems is based on the norms that develop in the communication of normal social and sociomathematics norms [14]. The pattern of communication-based on these norms can form social intelligence for students, where social intelligence is one type of intelligence that is of concern in constructivist social understanding [6,7].

In learning, especially in mathematics learning, are known two norms, namely social norm and sociomathematic norm [13,15]. Social norms are a common pattern of social interaction that is not tied to topics or learning materials such as how to properly present opinions and respect the opinions of
others [6], understanding and awareness that students are expected to communicate their solutions and ways of thinking [16], explaining and justifying solutions, listening and making sense of each other's solutions, marking the unintelligible and asking questions when not understanding, and explaining why they are not accepting explanations for their invalidity [13]. While sociomathematic norms are specifically linked to mathematical arguments, namely how learners engage in interaction and negotiation processes to understand mathematical concepts such as the understanding of what arguments can be mathematically acceptable [6,16,17]. The norms or values contained in the mathematical domain are consensus, freedom, consistency, universality, and strictness [18], sociomathematic norms are normative behavior more specifically related to mathematical domains [13].

Sociomathematical norms are social norms related to the nuances of mathematics because sociopathic norms specialize in learning mathematics rather than on other learning. If students speak mathematics, they must learn about mathematics [19]. In general, social norms and sociomathematical norms are very different [16]. Some of the ways that encourage the development of sociomathematical norms are focusing on students' attention in mathematical discussions, understanding of ideas among students, and exploring activities between these ideas. Sociomathematic norms are an explicit or implicit rule that influences student participation in mathematical activities [3]. The sociomathematic norm is concerned with how students believe in and understand mathematical knowledge, placing themselves in a social interaction in building mathematical knowledge.

Social norms are a common pattern of social interaction that is not tied to topics or learning materials, whereas sociomathematical norms are specifically linked to mathematical arguments, namely how learners engage in interaction and negotiation processes to understand mathematical concepts. Social norms can be seen from students' understanding and awareness of how appropriate to communicate solutions and ways of thinking, whereas in sociomathematical norms can be seen from the understanding of what kind of argument can be mathematically acceptable [6]. In other words, social norms are related to etiquette or norm in communicating, whereas in socio mathematical norms etiquette in mathematical communication.

The sociomathematics norm is divided into two: (1) the sociomathematic norms associated with the problem-solving process of this norm focus on the expectations of how problem-solving should be done. An example is attempting a variety of problem-solving strategies and verifying the outcomes of completion, and (2) sociomathematic norms associated with participation in joint activities for problem-solving, this norm focuses on the ideal form of social interaction that is expected to support productive problem-solving activities [17,20].

The sociomathematical norms, in its application to learning, have contributed to improving students' mathematical abilities [7]. For example, if students find a solution to a given problem, they cannot conclude that they have finished working, they are expected to reflect on the processes they use to resolve the problem and expand their findings. This suggests that solving problems, justifying or inferring from problem-solving activities, and arguing transforms into sociomathematic norms involving mathematical learning at different stages of the solution [15,16,21]. Also, questioning and challenging activities encourage students to cultivate curiosity to find efficient solutions to their problems [7].

3.2. Sociomatmatic Norms on Learning Mathematics

In this modern era, mathematics learning is accepted as a social activity. Students who are considered subjects of knowledge will automatically be recognized as social subjects based on their history and culture. But in reality, there are still some people who believe that learning mathematics is just an individual process, and social interaction does not play an important role in it.

In line with the notion of a constructivist who holds that the cognitive development of an individual is a result of communication in social groups that can not be separated from everyday life, the learning process of an individual is not only independent but also a social form that runs together [3]. In social interaction, attitudes and behavior are important elements for creating a good relationship.

In general, students 'social intelligence can be formed by students' behavior or interaction with the student's surroundings. Gardner mentions that one effort that can be done to develop interpersonal intelligence (including interaction ability or social ability) is a form of social experience [3]. In this
regard, Potential students need to be organized and utilized in the process of mathematics learning so that it can collaborate with logical, consistent, and systematic mathematical values [13].

In social interaction or at least in group discussions, every individual needs a rule of how a person behaves or behaves often referred to as the norm. In general, the norms used in social interaction in everyday life are social norms. In the context of mathematical learning, the governing norm is known as the sociomathematic norm. Sociomathematical norms evolve in the interaction process during mathematics learning. The interaction process has two important indicators, namely the ability of mathematical communication and social skills that students use to achieve understanding and agreement and sociomathematic norms related to students' beliefs about collaborative activities when working together to solve a mathematical problem. Therefore, in the implementation of learning mathematics in class, teachers need to implement a model of learning that provides opportunities for students to collaborate to create an interactive learning atmosphere.

Sociomathematical norms, in general, are social norms or social interactions tied to mathematical topics, materials, and learning. So the aspects to be considered for developing sociomathematic norms are friendship or cooperative behavior patterns and mutual support between two or more individuals.

In mathematics learning, sociomathematic norms have contributed to improving students' math skills [7]. Understanding and exploration of ideas in mathematics lead to communication or interaction within social groups so that it can be used to help students to exchange opinions so that the problems faced by the students can be solved, discussions that occur in groups. In other words that in socio mathematics norms, negotiation is related to what sort of troubleshooting procedures will be used to solve the problem.

For example, if students find a solution to a given problem, they can not conclude that they have finished working. they are expected to reflect on the processes they use to resolve the problem and expand their findings. This suggests that solving problems, justifying or inferring from problem-solving activities, and arguing transforms into sociomathematic norms involving mathematical learning at different stages of the solution [15,16,21]. Also, questioning and challenging activities encourage students to cultivate curiosity to find efficient solutions to their problems [7]. Learning about the role of teachers in learning becomes less biased; the use of learning media and learning activities is proven to support social development and social norms of mathematics among students [22].

One aspect that must be considered in the formation of sociomathematic norms, namely friendship [23]. In general, friendship is a term that describes the behavior of cooperation and mutual support between two or more individuals. There are seven social skills that are relevant to friendships in the math class, such as the ability to accept rules or standards, cooperate and compete, risk-taking ability, develop communication skills, develop negotiating skills, avoid conflict, and develop understanding in group interaction [6].

Social skills that can be developed in friendship include conform, cooperate and compete, take risks, develop communication skills, develop negotiation skills and tact, resolve conflicts, and develop shared meanings for group interaction [24,25]. Also, the most emphasized to form a friendship is familiarity [23]. This is because students will more easily interact with someone already familiar, and make them comfortable in learning, issuing ideas, asking questions, even challenging answers provided by his friend. So indirectly will have an impact in constructing knowledge gained.

The friendship group came about because of the need to provide the necessary conditions for students to successfully challenge and justify the idea. Friendship offers an environment in which learning leads to greater cognitive change for social situations that can be transferred to mathematics learning. This is in line with the opinion that friends are better study partners than those who are not friends [26], friendship is the reason students can accept decisions, opinions, and so on [23].

In response to this, it is best to study mathematics so that group discussion activities can be formed; groups are formed based on friendly relations. Through a friendly relationship, there emerged a sharper discussion because the members of the group did not hesitate to express their opinions on a problem and at the same time to criticize a group of friends. The habit of expressing this opinion will lead to the ability to analyze the ability of self-managing information before the argument is expressed. This activity can improve students' ability in problem-solving and mathematical communication.
The sociomathematical norm can be seen based on student activity in learning mathematics in the classroom. In general, sociomathematical norms are divided into two dimensions, the social dimension, and the psychological dimension. This is in line with opinion, that sociomathematical norms in this class can be divided into two dimensions, namely social dimension includes class social norms, sociomathematical norms themselves, and classes of mathematical practice [15,16,21]; While the psychological dimension includes beliefs about the role and activity of mathematics in schools, beliefs in mathematics and values, and mathematical conceptions. The close relationship between these two dimensions causes socio-mathematical norms important to be developed in mathematics learning.

In addition to the formation of discussion groups based on friendship or familiarity, to develop sociomathematical norms in learning mathematics need to develop learning activities such as giving math problems to students to be solved in groups that begin with open question; problems discussed in the group are then discussed in class; differences in perceptions, ways of thinking, arguments, expectations, and obligations in discussion can be neutralized through negotiation to be taken to be shared; And Teachers act as facilitators and managerial motivators needed to direct students to connect the mathematical values that exist in their thinking and habits [13].

From the discussion group, students can be seen socio-mathematics either directly or indirectly. So to express sociomathematical norms can use indicators of experience of math, Explanation of mathematics, Mathematical differences, Mathematical communication [16,21,27].

4. Conclusion
Sociomathematical norms are social norms associated with the nuances of mathematics; in other words the sociomathematical norm is the behavior of students relating to learning mathematics. Sociomathematical norms can be observed and developed for students; visual media used in learning mathematics should be integrated into discussions to solve mathematical problems. In the stages of the discussion, group breakup can consider aspects of student friendship. The aspects of observing the socio-mathematical norms are: (1) the experience of math, (2) the explanation of the mathematics, (3) mathematical differences, (4) mathematical communication.

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