Traditional ceremony ki ageng wonolelo as mathematics learning media

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Abstract: Mathematics learning requires real situations that are often encountered by students. Students' diverse backgrounds and the presence of local wisdom from the surrounding community can actually be utilized for mathematics learning. Proposed an ethnomathematics-based curriculum to be implemented in mathematics learning [1]. The curriculum contains literacy, matheracy, and technocracy. In this article, researchers explain how teachers can utilize ethnic culture and traditions in the region for use in mathematics learning. This research, conducted in Wonolelo Village, where the village annually organizes Ki Ageng Wonolelo Traditional Ceremony. Researchers tried to link some tools used during the ceremony with school math. The hope is to add literacy to the objects around students that can be tied to school math. The objective is for mathematics learning to be meaningful and for the local culture not to be forgotten by future generations.

1. Introduction
Mathematics learning requires everyday situations to make it easier for students to understand math. This is explained in a study conducted by[2]. Forms of everyday situations can be games, everyday problems, or the culture around the students. For example, when the summing lesson, teachers can use water and milk cans to introduce the concept of volume, observing the tiling is when teaching Pythagoras, area, transformation.

Around us, there are many objects, events, games, social behavior of the society that can be used as a context of learning mathematics. However, sometimes people do not realize that the activities they do use mathematical concepts. We can observe the builders during ceramic installation. Before installing, it is necessary to ascertain whether any corner in the room to be installed ceramic is right-angled. The builder measures 6 cm on the side, and 8 cm on the other. Then he stretched the rope, if the length of the rope 10 cm, then the elbow. In this situation, the builder uses the concept of Pythagoras, and perhaps he does not realize it.
Unfortunately, many teachers do not take advantage of problems around students to be mathematical context. Learning contains only theories that must be memorized, not practiced so that mathematics loses meaning. Students who have studied Pythagoras, not necessarily he can do the installation of ceramics well. Conversely, builders who may unconsciously use the concept of Pythagoras in the installation of ceramics. Mathematics learning requires a real object for students interested and understood, the goal is that students can solve problems in the real world with mathematics [3], [4]. One science that focuses on mathematics in culture and daily life is ethnomathematics.

Ubiratan D’Ambrosio first introduced Ethnomathematics in 1980. Starting from the idea, many researchers are inspired to do research. In Indonesia, some researchers have put ethnomathematics as one of the focus of research, including [3], [5]. Ethnomathematics is derived from the word ‘ethno+mathema+tics’. Ethno includes ethnicity, culture in certain groups, races, and the environment, the mathema includes understanding and observing the real world, while tics is the art and technique of explaining things [6], [7]. The main goals of ethnomatics in education are: (1) to enhance creativity, help people to develop their potential and maximize their capabilities and (2) to increase the love of the homeland, inculcate values, understand the truth, and be responsible in society [6], [8], [9].

Studies that illustrate cultural activity from a mathematical point of view all suggest the idea that much human activity has used mathematical forms and that mathematical activity is not derived from mathematicians. A study exploring the culture of the Baduy tribe and using the local wisdom of Baduy tribe for learning mathematics in formal school to be more meaningful and valuable [3]. The people of the Baduy tribe are not mathematicians, but they use mathematical activity without them knowing it in everyday life, such as geometry application when making a house, equipment, using vector concept in making Geuleubeug. People of Aboge in determining the Islamic calendar such as Eid Mubarak, determining the fasting of Ramadan, and the Eid Adha [10].

One focus of ethnomathematics is to integrate the surrounding culture with mathematics learning in schools. The relationship between various existing cultures and mathematics learning[11]. Another case with research argued that ethnomathematics is a form of resistance to technological advances and modernization, so the concept of ethnomathematics become problematic[12]. On the one hand, ethnomathematics plays an important role in developing values, love of the homeland, local wisdom through the study of mathematics, but on the other hand, ethnomathematics also inhibits modernization. Of course, this becomes a separate focus in developing curriculum, learning model, and ethnomathematics based learning tool that can be balanced between modernization and the surrounding culture [13]–[15].

Mathematics education emphasizes criticism for the cultural dimensions of society in mathematics education [6]. The research produced an ethnomathematics program consisting of modern trivium of literacy, matheracy, and technocracy as an alternative curriculum for contemporary education. Formal mathematics education is a process of cultural interaction, and every child and teacher may experience some degree of social and cultural conflict in the process[16], [17]. Mathematics learning will be more effective and meaningful if the teaching starts from a familiar situation of learners[18]. Utilize a wealth of students' ethnographic knowledge to foster the development of conceptual knowledge. Ethnomatics have a role in teaching in formal schools in relevant contexts and problem-solving strategies to give meaning to the mathematical concepts.

One of the existing culture in Yogyakarta is Traditional Ceremony of Ki Ageng Wonolelo. Tradition Ceremony of Ki Ageng Wonolelo held in the month of Safar year Hijriyah (the year of Moslem). This tradition is always commemorated on Friday Safar month every year since 1968. The procession of this tradition has changed over the times. In essence is carnival heirloom Ki Ageng Wonolelo. It is namely: gondhil (Ontokusumo clothes), bandhil (this thing has not been found), Al Qur’an written by Ki Ageng Wonolelo, kopyah, cupu (a pieces of wood mustaka mosque), and stick (is Javanesse language teken). Carnival heritage departing from Ki Ageng Wonolelo mosque leading to the Tomb of Ki Ageng Wonolelo.
In the implementation of this traditional ceremony, there are patterns or rules that become the guidelines during the procession. The procession begins with great reading and continued with the regular recitation in Pendopo Ki Ageng Wonolelo. At the peak of the procession, performed the heirloom carnival and apem spread. The route of the heirloom begins from Pendopo Kelurahan then to the relics of Ki Ageng Wonolelo and headed to Ki Ageng Wonolelo's grave. In the tomb, performed prayers and sowing flowers. After that, heirlooms are brought back to Ki Ageng Wonolelo's relic's house. When finished, then proceed with apem spreading.

Ki Ageng Wonolelo Traditional Ceremony has become the culture of the people of Yogyakarta, especially in Widodomartani, Ngemplak, Sleman city, province Yogyakarta. Already 49 years ago, the village community Widodomartani carry out the ceremony. However, until now the culture is still not used well for the learning process of mathematics. Therefore, researchers interested in exploring the Ki Ageng Wonolelo Traditional Ceremony and associated with school mathematics. It is important to study because students require mathematical objects that are realistic and close to them, so they are easier to visualize mathematical objects in the mind of the student. In addition, by integrating local culture with school mathematics, it will provide meaningful learning. As a result, errors in construct mathematical concepts and solving problems will decrease. From the cultural side, Ki Ageng Wonolelo Tradition Ceremony needs to get special attention so that the culture and tradition continues and young people are more familiar with one of them through math learning.

2. Method
This research is generally carried out through three main steps: pre-field data analysis, data analysis in the field, and overall data analysis. This research uses descriptive qualitative research type as a kind of research to reveal and obtain information thoroughly, extensively and deeply (Prahmana, 2017). In this research, ethnography method is used as the research method. In addition, this study also uses three boundaries of research coverage areas that form the basis of the study: community unity consisting of people who speak a language or a language dialect, a community unity field to obtain ethnographic descriptions (Prahmana, 2017).

3. Result And Discussion
In the procession of carnival, there are various tools and mountains that participated paraded in addition to the heirloom Ki Ageng Wonolelo, including offerings (see figure 2), mountain-shape pile of apem (traditional food made from rice flour, apem only exist in java), offerings, and Joli-Joli. Mountain-shape pile of apem a set of traditional foods named Apem, arranged in a conical shape that resembles a mountain. Because it is shaped like a mountain and composed of food named apem, the Javanese people especially wonolelo region named it with gunungan apem (see figure 3). It is weighs up to 2 tons, which is divided into two Mountain-shape. The word apem according to the story comes from the word ‘afuwun (Arabic language) which means of forgiveness. Joli-joli is shaped like a small pendopo house (the traditional house central java) composed of blocks and at the top covered with pyramid, on each (see figure 4).

Figure 2. Offering
Joli-Joli, Mountain-shape pile of *apem*, ranks of soldiers, and rules of ceremonies Ki Ageng Wonolelo Tradition ceremony can be utilized as a contextual learning mathematics learning materials. Students near course very familiar with the ceremony and many know the procedures and processions used tools. Capital is what teachers need to use for learning based on local culture [4], [16].

In Joli, the mathematical concepts that can be used are the building of beam spaces and the cut prism (see Figure 3). In Figure 5, the roof portion of the Joli-shaped is resembled a triangular prism cut by a plane.

To determine the area of the ABCD.IJ prism can be determined by summing the rectangular area of ABCD, trapezium ADIJ, trapezium BCIJ, triangle ABJ, and DCI triangle. The pronged prongs ABCD.IJ as in Figure 7.
Figure 7. The prism webs are sloped sideways

On the tool to bring offerings, can be used to teach the point projection. The tool used to carry the offerings is formed from a prismatic roof like in Joli-Joli then there are four pillars, and on the base rectangular shape. The buffer pole is perpendicular to the base of the place of offerings (see figure 8). It can be used for point projection learning in fields for high school students.

Figure 8. Place of offerings and point projection on the plane

Mountain-shape pile of apem is characteristic that exists in Kyai Ageng Wonolelo Traditional Ceremony. Since 2009, the shape of mountains of apem has changed from a cone shape to a square pyramid shape (see figure 9). The weight of mountains can reach up to 2 tons, at the top of the pyramid is a janur ornament and flower.

Figure 9. Mountain-shape pile of apem and rectangular

There is an interesting thing when the form of Mountain-shape pile of apem undergoes a change from a conical shape to a quadrangular pyramid shape. Mathematically, the pyramid blanket has a larger area than the cone blanket (same height and cone, and cone diameter equal to the side of the pyramid). Here is a proof that the area of the conical blanket is smaller than the area of the pyramid quilt. The assume wide blanket area of cone \( L_{\text{wide blanket area of cone}} \) as wide blanket area of pyramid \( L_{\text{wide blanket area of pyramid}} \), so:

\[
L_{\text{wide blanket area of cone}} = \frac{\pi rs}{4} L \Delta
\]

\[
3.14 \times r \times s = 4 \times \frac{2 \times r \times s}{2}
\]

Thus, it can be concluded that the area of the pyramid blanket is greater than the area of the conical blanket. The Wonolelo people thought instinctively mathematically (based on spontaneous thought/instinct), they assumed that the pyramid area was larger than the cone area. They think so because it is based on a circle that is on a square. They
never calculate the surface area of pyramid and cone as the basis for decision making of the shifting of the mountain form.

The three tools, namely Joli-Joli, place of offerings, and mountain-shape pile of *apem* can be used for learning mathematics in school. These tools are always encountered during the Kyai Ageng Wonolelo Traditional Ceremony and are very familiar to the surrounding community. Teachers can invite students to Wonolelo Village to be implemented outside the classroom or, the teacher shows the images of these tools and is associated with the mathematical concepts being studied.

4. Conclusion

School math learning requires real objects close to the lives of students and schools. Kyai Ageng Wonolelo traditional ceremony is a traditional ceremony that has been passed down and until now has not been utilized for learning in the classroom. The researcher's review of the hidden mathematical concepts in the Kyai Ageng Wonolelo Traditional Ceremony is not much, but the little review can be used as a reference to teach students that mathematical concepts can be found anywhere, one of them from culture. The hope, by integrating local culture with school mathematics, will provide meaningful learning to students. Thus, students do not make many mistakes in understanding mathematical concepts and solving mathematical problems, especially thinking interference [19].

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