

## Conference Paper

# Ethnomathematics Role As an Encouragement of the Growth of Student's Nationalism

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## Abstract

This article has been preceded by a research activity in Guangxi China and collaborated with Prof. Guo Yuanbing, Ph.D, Deputy Director of Guangxi Normal University. The research method used a qualitative approach. The research activities included field observations to explore forms of ethnomathematics. The problem: How was the role of ethnomathematics as an encouragement of the growth of students' nationalism? The objectives were: (1) Finding the role of ethnomathematics in encouraging the growth of students' nationalism. (2) Finding the objects of ethnomathematics that can encourage the growth of students' nationalism. Data analysis includes: data reduction, data display, data interpretation, and conclusion/verification. The results were as follows: (1) The learning by applying of ethnomathematics approach can play a role in encouraging the growth of students' nationalism. (2) To optimize the role of ethnomathematics as an encouragement of the growth of the spirit of nationalism, the teacher needs to choose the objects of ethnomathematics based on the work of the nation's own.

**Keywords:** Ethnomathematics, Mathematics Learning, Nationalism

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## 1. Introductions

### 1.1. Background

Indonesia is a big country, large, and much islands. The sense of nationalism needs to be nurtured and cultivated to the students so that the unitary state of the Republic of Indonesia continues to exist and become more victorious. The students need to develop a sense of pride in the artistic of their own nation's, such as the existence of the *Borobudur* Temple in Central Java, or for example the existence of the *Lamin* Traditional House in East Kalimantan, and others. Cultivating a sense of love for the homeland and culture of the nation can be carried out since an early age through ethnomathematics, which teaches mathematics by integrating cultural values and products. The positive impact of use the ethnomathematics in the learning is that the students since elementary school have instilled a noble spirit to have a strong nationalism spirit, to preserve the

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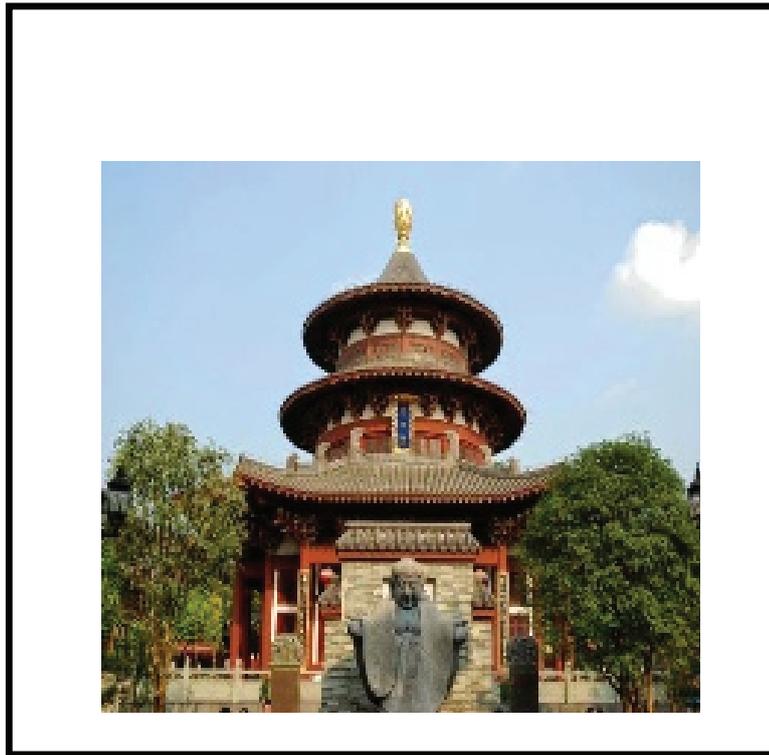
environment, and to know the benefits of mathematics for their environment. Which is the mind, can the ethnomathematics play a role in fostering a spirit of nationalism?

The writing of this article was preceded by research in Guangxi China and collaborating with Prof. Guo Yuanbing, Ph.D, Deputy Director of Guangxi Normal University (GXNU). The research, explores and searches of Chinese cultural objects, which can be used as a tool to apply the ethnomathematics approach from Elementary, Junior High School, until University level.

Amit and Fouze (2018), wrote that ethnomathematics is a learning approach that is carried out by teaching mathematics by linking mathematics with the artistic of the nation's own culture and involving the needs and life of its people. If mathematics learning is given to the students through an ethnomathematics approach, it is hoped that there will be a growing love for the homeland, pride, and love for their own culture, and be ready to preserve the cultural products that are on our beloved earth. Another positive impact is expected, since the students in elementary school have been instilled a noble soul to have a strong nationalism spirit, ready to protect the environment, and know the benefits of mathematics to help maintain the existence of the nation and state. According to Nishimura *et al* (2016), Kim & Taylor (2017), and Zhuojun & Robert (2018), good morals are necessary for the students. The state really needs candidates who have good morals.

On the other hand, the Chinese state also has a large population, a vast country, and a very diverse regional culture. Therefore, the Authors of this article have intentionally carried out foreign cooperation research to explore the practice of implementing ethnomathematics that can be used to foster a sense of love for the country. Therefore, the research team has carried out collaborative research into China, related to the ethnomathematics. Collaborative research is carried out with Guangxi Normal University, China. Guangxi is one of the autonomous regions in China, in the mountainous region on the southern tip of China, has placed it on the border of Chinese civilization throughout much of China's history. The name "Guang" now means "stretch" and has been associated with the region since the formation of Guang Prefecture in 226 AD.

The Guangxi region became the first part of China during the Qin dynasty in 214 BC. The Guangxi people generally worship in temples. Not only in Guangxi, many temples in China have an ethnomathematics architecture. The following are juxtaposed religious buildings in China and Indonesia, which are expected to be an object of ethnomathematics that can be linked to fostering a sense of the students love for the country. Pay attention to Figure 1 and Figure 2 below.



**Figure 1:** Temple in Guangxi, China.

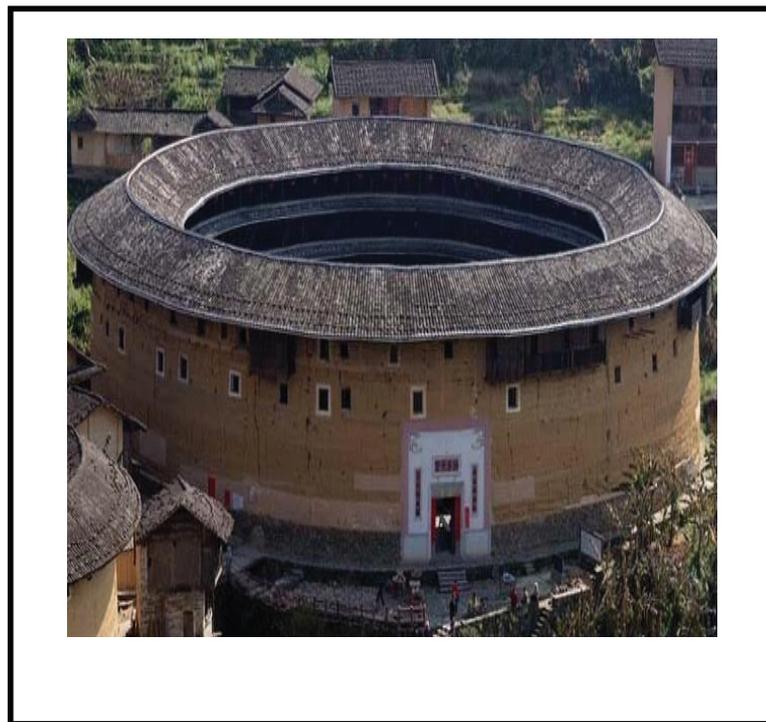


**Figure 2:** Borobudur Temple in Jawa Tengah.

From Figure 1 above it can be seen clearly that there are various forms of flat building and building space, such as circles of various diameters. The circle above has a smaller

diameter than the circle below it. Implicitly contains the concept of comparison. In Figure 2, it appears that the Borobudur temple building was built geometrically. The designers of the two ancient buildings seemed to implicitly show their expertise in the concept of measurement and geometry.

The ancient buildings of the *Haka* Tribe house in China (Figure 3) are deliberately juxtaposed with ancient buildings in East Kalimantan (Figure 4). Both have mathematical concepts. Figures 3 and 4 are included with ethnomathematics content.



**Figure 3:** *Haka* Tribe House, China.

From Figure 3 it is clear that there are various circular shapes, some have a tube shape, and some other geometric shapes. Likewise, with Figure 4, there are concepts of triangles and rectangles.

Math counting games for children in Guangxi (in the form of Abacus) are also related to the addition or subtraction concept as shown in Figure 5. The same concept can also be taught through the use of *Dakon* games in Central Java (Figure 6).

In fact, the Chinese state has provided an example by preserving this ethnomathematics object well and using it in learning. China is also known as a country that has strict independence, integrity, and has a high-quality education system, so that Chinese technology products spread throughout the world. Nationalism needs to be given to the students since elementary school until University, which is integrated in the learning process/ lecture, especially in mathematics lessons using an ethnomathematics



**Figure 4:** *Lamin* Traditional House, East Kalimantan, Indonesia.



**Figure 5:** Abacus in China.

approach. If there are good examples of how abroad to integrate ethnomathematics such as in China, then these good things need to be adopted wisely and if possible can be modified to be implemented in Indonesia.



**Figure 6:** *Dakon Games* in Central Java

## 1.2. Problems

The problem that will be resolved through the study in this article are as follows. How was the role of ethnomathematics as an encouragement of the growth of students' nationalism? Of course, what is meant of the students is Indonesian students wherever students are. However, for completeness and comparative studies, the contents of this article have been preceded by research in Guangxi China and collaborated with Prof. Guo Yuanbing, Ph.D. This research, explores and searches of Chinese cultural objects, which can be used as a tool in applying the ethnomathematics approaches at all levels of education.

## 1.3. Writing objectives

Appropriate with the problems to be resolved, the objectives of the study in this article are as follows. (1) Finding the role of ethnomathematics in encouraging the growth of students' nationalism. (2) Finding the objects of ethnomathematics that can encourage the growth of students' nationalism.

## 1.4. Writing urgencies

The urgency expected from the publication of this writing/article through the International Seminar are as follows. (1) Lecturers of education at UNNES or other universities are expected to have a clear picture of the objects of the ethnomathematics and the role of implementing ethnomathematics for the students based on research collaboration between the UNNES research team and partner lecturers from Guangxi Normal University, China. (2) Lecturers of Mathematics Education at UNNES or other universities are expected to improve the quality of their lectures to prospective teacher students, related to how to foster a sense of nationalism through the ethnomathematics approach. (3) Students of the Mathematics Education Study Program or maybe the students from other majors who are interested in reading this article are expected to be more motivated to do PPL Between Nations or sit-in program activities at Guangxi Normal University, China.

## 1.5. Theory studies

### 1.5.1. The ethnomathematics approach

Ethnomathematics was first introduced by D'Ambrosio, a Brazilian mathematician people in 1977. Furthermore, in 1999, D'Ambrosio improved the meaning of the ethnomathematics. Furuto (2014), Vasquez (2017), and Maure *et al* (2018) stated that the ethnomathematics in the process of learning mathematics can be viewed as an approach to motivate the students in learning mathematics by linking mathematics material which taught with existing local culture, or by practice-existing, or existing cultural practices.

### 1.5.2. Growing nationalism through the ethnomathematics

Currently in Indonesia are being encouraged activities to strengthen character education. One of them is the value of Nationalism. Budhiman *et al.* (2017) wrote that the character is nature, characteristic, morals, behavior, or personality that distinguishes an individual from other individuals. While Character Education is a conscious effort and planned to realize the atmosphere and process of empowering the potential and civilization of a person/ student to build good personal or group character as citizens.

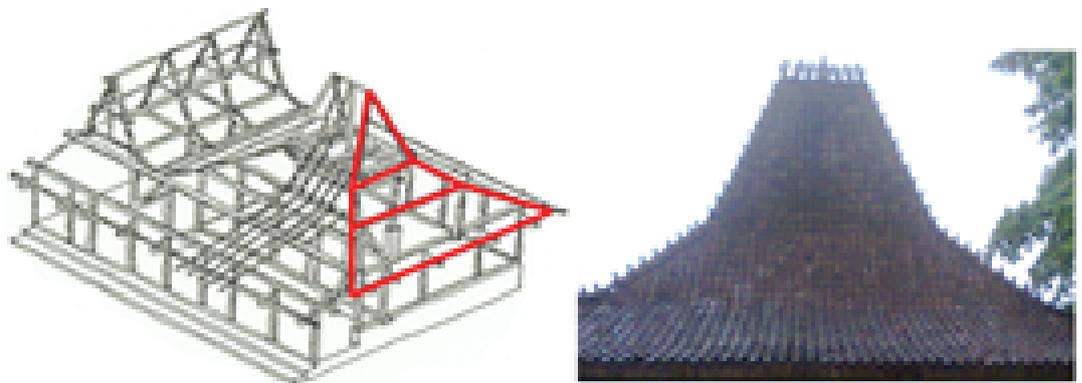
By implementing the ethnomathematics approach, the noble personal character of students/students is expected to be grown. For example, students become more elevated in their religious values and sense of nationalism.

Character education is comprehensive, not only related to cognitive issues, but also contains affective and psychomotor content. Character education is related to academic aspirations and motivation, pro-social behavior and democratic values, conflict resolution skills, moral maturity, responsible attitude, respect, self-control, self-esteem, social skills, and trust and respect for teachers.

The value of nationalist character is a way of thinking, behaving, and acting that shows high loyalty, care, and respect for the language, physical environment, social, cultural, economic and political nation, placing the interests of the nation and state above their self and group interests.

Nationalist sub-values include appreciation of the nation's own culture, safeguarding the wealth of the nation's culture, willing to sacrifice, superior, and achievement, love the motherland, preserve the environment, obey the law, discipline, respect the diversity of culture, ethnicity and religion.

Furthermore, in below is given an example of the use of the culture of Traditional Houses in Kudus, Central Java, which can be used to explain geometrical structures and to foster a sense of love for the nation's culture (Figure 7).



**Figure 7:** Roof of Traditional Houses in Kudus.

Examples of the application of ethnomathematics above, reinforce the opinion of Mungmachon (2012) and Singsomboon (2014), that preserving national culture is the basic knowledge gained from living in balance with the surrounding environment. By showing the artistic of the nation's children in the past, it's expected that it will grow in the hearts of the students with a high sense of nationalism.

## 2. Methods

Writing this article has been preceded by research activities in China. The research method used was qualitative approach. The subject of this research, was some lecturers and students of the Local Student Class at Guangxi Normal University (GXNU) in China. Selected only one class. The selection of the class was submitted to GXNU's lecturer, as an International Partner Lecturer. The study location was in the Local Student Class at Guangxi Normal University. The time of the study was through visiting Lecturers as UNNES Research Team to Guangxi Normal University in China when this study was conducted.

Data sources of this qualitative research are divided into 2 (two), namely from field data and data from learning at Guangxi Normal University. Field data in the form of the ethnomathematics forms in Guangxi China. Forms of the ethnomathematics can take are like (1) temples or inscriptions, (2) pottery or traditional equipment, (3) local buildings of cultural value, (4) handicraft motifs of traditional cultural value, or (5) traditional games.

Learning data comes from the students and lecturers of Guangxi Normal University, China who were selected as research subjects. The data is in the form of survey results, observations, interviews, and triangulation results of research on how to integrate the ethnomathematics approach in learning mathematics at Guangxi Normal University, China.

Data analysis in this study using Matthew B. Miles & A. Michael Huberman rules. Miles and Huberman (2014) and Moleong (2010) argued that the qualitative data analysis was done interactively and lasted until the thorough. Activities in data analysis include: data reduction, data display, data interpretation, and conclusion/verification.

## 3. Results of Study and Discussion

The following is presented the results of the study in the form of examples of findings which are real activities in showing the role of the ethnomathematics approach in fostering the nationalism of students. The study in this article is equipped with a case study in mathematics learning provided with the ethnomathematics approach. Based on the results of the FGD at the time of the study, the ethnomathematics approach was able to foster a nationalist spirit for students. The FGD was followed by the UNNES research team, research partner lecturers, GXNU Mathematics Education lecturers, and local GXNU students.

. First, there are similarities of opinion that the ethnomathematics approach is able to encourage the growth of students' nationalism. Its role, as a stimulus of the growth of the nationalism in students, heightens the absorption of the students in learning mathematics, and encourages the students to preserve the nation's cultural products. Second, the ethnomathematics object that can encourage the growth of students' nationalism is an ethnomathematics object which is the artistic of the nation's own children, its shape is still original and relatively intact, and the ethnomathematics object is preserved and can be enjoyed by all people, both local and foreign tourists.

### 3.1. Discussion

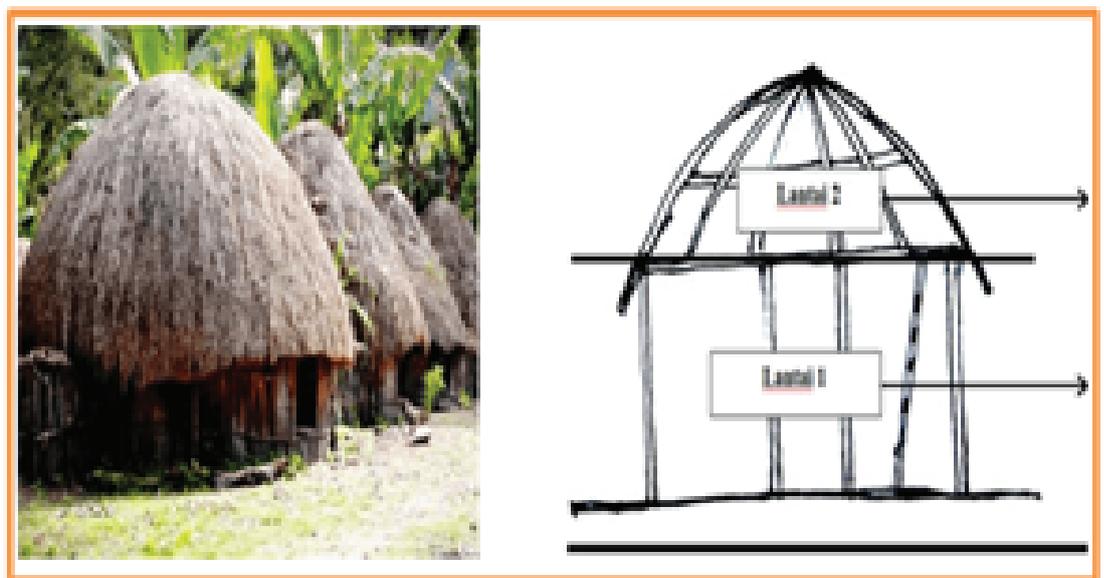
In China, there are pretty much of forms of the ethnomathematics objects, especially in Guangxi China that are able to play a role in fostering the nationalism of the students. The following is presented the results of photographs in the field of ethnomathematics object forms that can be associated with the subject matter of mathematics to foster a spirit of nationalism. Consider the following Figure 8.



**Figure 8:** A photo of an ancient cultural product of a sculptor from the Chinese people in the past, in the form of a table made of carved stone. This ethnomathematics object is very maintained in its cleanliness and authenticity.

As a cultural product, the table edge contained in this photo depicts a circle. These cultural product objects can be used in ethnomathematics as semi-concrete tool to show the shape of a circle, which can be calculated the circumference of the table and the surface area of the table. Students are inculcated to preserve the cultural objects of the past.

Indonesia has a lot of cultural diversity. From Sumatra until West Papua. Haryanto *et al* (2017) wrote that in West Papua had objects of the ethnomathematics. As a comparison, Figure 13 below shows the traditional houses in West Papua which are also preserved. This traditional house building can also be used for mathematics lessons with an ethnomathematics approach.



**Figure 9:** Traditional Houses in West Papua, Indonesia (The second floor for family resting place. The first floor to sleep and store valuables).

Pay Attention Figure 10 which compares the objects in China and in Indonesia that can be used to foster a spirit of nationalism.

In Figure 10 above, a photo of a cultural product in the form of the gates of Guangxi Normal University. While in Figure 11 above, is a cultural product in the form of traditional houses in Kudus region of Central Java. The form of the gate for the entrance to the Guangxi National University or the traditional houses in Kudus, Central Java can also be used as objects in the ethnomathematics which play a role in encouraging the growth of student's sense of nationalism. Objects of cultural products that are valued ethnomathematical, Figures 10 and 11 above can be used as geometrical constructs to show the shape of a circle that is squeezed in by constructing triangles, squares, rectangles, or trapezoidal which can be calculated the perimeter and also the area.



Figure 10: Gate at GXNU, China.

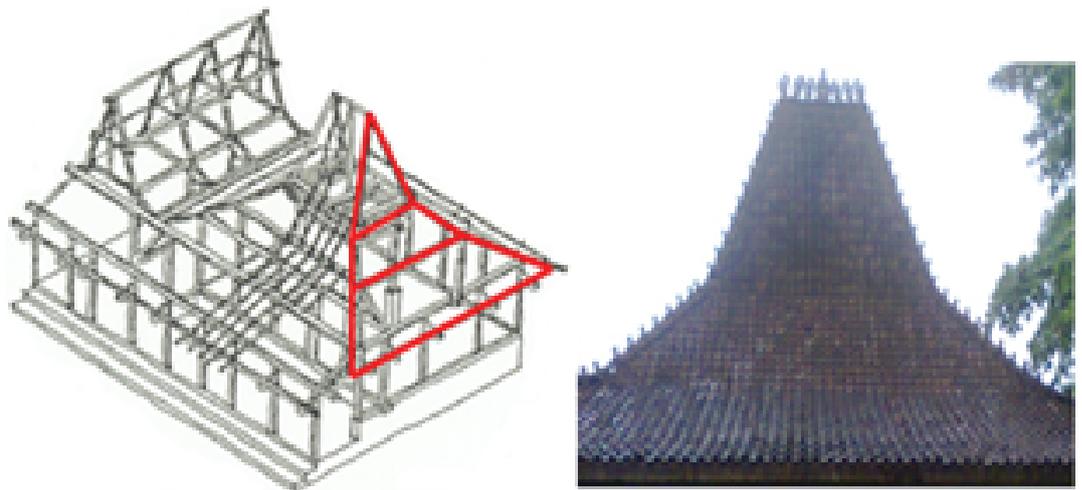


Figure 11: Traditional House Roof in Kudus, Central Java.

The ethnomathematics approach as a stimulus force for nationalism can also be applied at the elementary level. The following this, an example of an ethnomathematics object that can be integrated to mathematics in elementary school.

In Figure 12 above is a cultural product namely *Potehi* Puppet, used to explain the addition concept of Natural Numbers. While Figure 13 above, is a cultural product, *Wayang Kulit*, which is used to explain the concept of addition. Abiam *et al* (2016) in



Figure 12

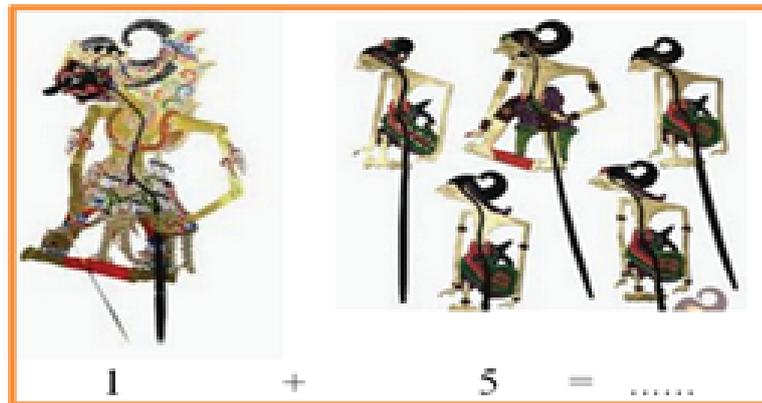


Figure 13

his research concluded that mathematics is taught by an ethnomathematics approach, the results are better than students who are taught mathematics with conventional approaches.

Pay attention the figures 14a and 14b below. Figure 14a is an ancient artifact of relics of royal buildings in the past located in Guilin China. The buildings are cube-shaped. For example, Figure 14b is a geometric image of a cube building in Figure 14a. Pay attention to Figure 14b.

Example: Pay attention to ancient artifacts from ancient royal buildings located in Guilin China. You must play a role in preserving it. The buildings are cube-shaped. Now, do the problems related to this cube. Known: ABCD.EFGH is a cube. If the length of edge is 3 meters, calculate the length of space diagonal BH.

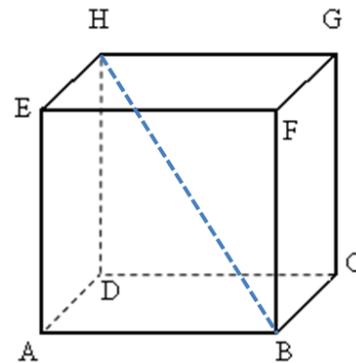
Answer:

In  $\triangle ABD$ , the length of the BD is calculated using the Pythagoras Theorem:

$$BD^2 = AD^2 + AB^2$$



Gambar 14a



Gambar 14b

Figure 14

$$BD^2 = 3^2 + 3^2$$

$$BD^2 = 18$$

$$BD = \sqrt{18} = 3\sqrt{2} \text{ cm}$$

In  $\triangle BDH$ , the length of the BH is calculated using the Pythagorean Theorem:

$$BH^2 = DH^2 + BD^2$$

$$BH^2 = 3^2 + 18$$

$$BH^2 = 27$$

$$BH = \sqrt{27} = 3\sqrt{3} \text{ cm}$$

## 4. Conclusion

Based on the description above, the following conclusions can be drawn. (1) The learning by applying of ethnomathematics approach can play a role in encouraging the growth of students' nationalism. (2) To optimize the role of ethnomathematics as an encouragement of the growth of the spirit of nationalism, the teacher needs to choose the objects of ethnomathematics based on the work of the nation's own.

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