Exploration of Comparative Concepts in the Ethnomathematics of The Buton Traditional House

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Abstract. The Buton community has practiced mathematical culture in the form of a Buton traditional house called banua tadha (right house). The purpose of this study was to explore the comparative concepts in the ethnomathematics of the Buton traditional house. This research is qualitative research with an ethnographic approach. The results of this study indicate that every Buton traditional house contains several comparative concepts in the ethnomathematical: (1) the width of the door and the width of the stairs, (2) the walls of the house and the tutumbu, (3) the width of the house and tutumbu, (4) wall and pillar heights, (5) the height of the bhate and the length of the limana bathe, (6) the height of the front wall to the height of the side walls, (7) the width of the stair post with the size of the rungs of the stairs, and (8) wall height and house pole height, and (9) the shape of a right triangle formed by a crutch (konta), a pole (ariy), and a buffer (tadha). These comparisons can be used in learning mathematics to pass on the ethnomathematical local wisdom of the Buton traditional house.

Keywords. Comparative concepts, ethnomathematics, banua tadha, Buton

1. Introduction
Mathematics is a compulsory subject at all levels of education with all its problems. Various research results show that students have difficulty in understanding the mathematics material taught by teachers in schools which results in the low ability of students to think, be literate, and solve mathematical problems. Solving this problem has been carried out by various parties, both teachers as educators and implementers of mathematics learning in schools, researchers, and related educational institutions but the problems of learning and learning outcomes in mathematics are still unresolved so that until now it is still a study that attracts many parties to contribute in solving it. This research was carried out as one of the researchers' efforts to contribute in terms of seeking a variety of contexts that exist in the student environment that can be used to create interesting, useful, and challenging learning processes of students' thinking and at the same time reveal the various values of local wisdom that exist to know, inherited and preserved to the next generation. The potential of local wisdom can be used to improve the students' ability in science, literacy, and either [1] Local wisdom can be used as a context so that learning becomes interesting and as a problem so that students can be trained to think to solve problems. Buton is one of the islands in Indonesia which was formerly known as the Buton kingdom which has a variety of potential local wisdom that can be utilized in learning mathematics. Buton's traditional house known as banua tadha (right house) is a proof of Buton's local wisdom in thinking and practicing mathematics. In the structure of the Buton traditional house, various mathematical concepts can be known that can be used or developed as contexts in learning mathematics.
The use of ethnomathematical cultural contexts can help students relate mathematics to the real world in learning mathematics [2]. If viewed from various problematic concepts in learning mathematics, the concepts of fractions, division, and comparison are similar mathematical concepts and are very difficult for students to understand, especially if presented in the form of story problems. Several studies show that there are several weaknesses of students in solving story problems such as not understanding the language of the questions so that it has an impact on the low ability of students to make representations of the story problems into mathematical models or other representations that are known and can be followed up in the form of solving these problems. This condition is caused by students, not interest in solving the problem. Students do not feel the benefits of the math material taught by the teacher. Mathematics material that is already so difficult and abstract should be presented more attractively by utilizing the potential and daily activities of children in their environment. Here, the potential role of local wisdom needs to be explored and utilized in learning because its use is believed to be interesting, useful, and can be improved to challenge students' thinking processes in learning mathematics. Related to the problem of comparison as one of the mathematics materials that are very difficult to teach or train students. To solve these problems, ethnomathematical context-based learning is needed to activate students so that they can solve problems critically [3]. Ethnomathematics provides direction for mathematics educators to take advantage of mathematical cultural activities that exist around students as powerful tools so that they are more active in contributing to creating a dignified society [4]. Utilization of traditional house ethnomathematics can help realize mathematics learning that attracts student activities in the learning process. It is necessary to explore more deeply whether the potential of Buton local wisdom in the Buton traditional house can be used as a context for teaching comparative materials in schools. This is very important because the Buton people believe that they have practiced mathematics for many years as evidenced by their meticulousness in building traditional houses, forts, boats, and other historical evidences on Buton Island. Ethnomathematical practice has also been carried out by the people of West Java for many years [5]. The mathematical cultural practice of a cultural group reflects that part of the characteristics of the life of that cultural group which is developed to serve their interests according to the social situation they face [6]. This research was conducted to explore the potential of comparative practice in building Buton traditional houses.

The activity of a cultural community group in practicing mathematics is known as ethnomathematics [7]. This ethnomathematical activity can be in the form of artifacts, traditional ceremonies, traditional games, numbers, and patterns. The results of the practice of mathematics culture are not necessarily the same for each region which reflects the cultural richness of a community group. As an area that once stood as an empire and was highly recognized by the Dutch VOC, Buton since ancient times has had natural resources that have attracted the attention of traders who tread the archipelago's maritime routes. Buton has a wealth of types of teak and ironwood (wola) which are then used as materials to make Buton traditional houses. Buton's carpentry skills in building stilt houses that are passed down from generation to generation have become a potential that distinguishes Buton from other regions. The uniqueness of the Buton traditional house has attracted experts on stilt houses and researchers. This is due to the strength of the Buton traditional house in the form of a house on stilts and made of wood without the use of iron or the like, but the Butonese traditional house can last even for hundreds of years as can be seen from the Kamali brick of one of the palaces of the sultan of Buton which still standing strong and valiant until now even though it is 141 years old since it was founded in 1880.

One of the uniqueness of this Buton traditional house is the use of the concept of comparison and the concept of an elbow in its manufacture and the meanings they contain. This comparative local wisdom needs to be explored so that it can be developed in the form of mathematics subject matter so that it is better known, understood, utilized, and preserved by the next generation of Buton. Traditional houses can be used as a mathematics learning media which is a form of cultural implementation so that students are familiar with mathematics. Ethnomathematics provides a learning environment that creates good motivation and is fun and free from the idea that mathematics is scary [8].
Ethnomathematics raises cultural wisdom so that it can motivate students to learn mathematics [9]. The development of ethnomathematical learning tools is an innovation in learning mathematics in the constructivism paradigm [10]. The implementation of the ethnomathematical approach can improve student learning outcomes [11]. The empirical study shows that ethnomathematics can be used in learning to increase motivation. Activities, and student learning outcomes of mathematics. Students need to know the ethnomathematics of the Buton traditional house as part of the cultural heritage. The ethnomathematical potential of the Buton traditional house has not been studied and developed as a mathematics teaching material. The absence of teaching materials/books to link mathematics material with ethnomathematical concepts, especially the Buton traditional house, causes students to be less active and less skilled in mathematics which indirectly hinders the development of mathematics learning in schools. Therefore, it is necessary to study the ethnomathematics objects in the Buton traditional house which can be used as a reference source for learning mathematics based on the ethnomathematics of the Buton traditional house. This research was carried out to explore the ethnomathematical object of the Buton traditional house.

2. Method
This research is a qualitative study with an ethnographic approach. The object of this research study is the concept of comparison contained in the ethnomathematics of the Buton traditional house. The sources of this research are four people who understand well about the Buton traditional house and the mathematical concepts used, namely two Buton traditional housebuilders who have also retired mathematics teachers and two Buton traditional leaders. The main instrument of this research is the researcher himself. In addition, auxiliary instruments in the form of interview guides and observation sheets were also used. Before being used, these two auxiliary instruments were validated. Both of these auxiliary instruments have been declared valid and reliable to be used in revealing the data needed in this study. In addition, researchers also use tools such as recording devices and photo cameras to document the various data obtained. The observation method was used to observe the different types, sizes, and models of the Buton traditional houses in the research location as well as to make observations and measurements on the Buton traditional house buildings that were the sample of this study. There were 10 Buton traditional houses that were observed and used as objects of this research, namely two houses of the sultan, two houses of sultanate officials, and four houses of the general public. The interview method was used to explore further the views of the informants on the concept of ethnomathematical comparison in the Buton traditional house. Data were analyzed using qualitative data analysis techniques from Miles, Huberman, and Saldana [12]. The validity of the data was tested using triangulation techniques and sources.

3. Result and discussion
3.1 Types of buton traditional houses
In general, the Buton traditional house is called bhanua tadha (right house). Traditional Buton houses are diverse but can be distinguished according to (1) their shape, (2) the social status of the owner, (3) their use, and (4) the number of pillars. Based on this division, there are only four types of traditional Buton houses used as residences, as presented in Table 1.

Although the five types of traditional Buton houses are different, in terms of construction, all three of them consistently maintain the concept of the right house. This consistency is one of the reasons why the Buton traditional house remains upright even though it is built on several floors. Based on mathematical activities in making this Buton traditional house such as counting, measuring, locating, designing, playing, and explaining, we can get to know some ethnomathematical concepts in the Buton traditional house such as the concept of a flat wake (triangle, square, parallelogram, rectangle, trapezium, circle). and a rhombus), spatial structures (beams, cubes, cylinders, and trapezoidal prisms), parallels, similarity, relations, functions, coordinate systems, slopes, angles, and comparisons. The size of each part of the Buton traditional house reflects a very deep understanding of mathematical concepts or what is known as ethnomathematics. The evidence in this Butonnese traditional house has
shown that the Butonese not only understand a mathematical concept but are also able to practice it in various activities of daily life as shown in the construction of the Butonese traditional house.

**Table 1.** The division of the types of traditional Buton houses and their descriptions

| No | House types       | description                                                                                                                                 |
|----|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1  | Kamali/malige     | Sultan's palace, four floors, two-tiered roof, a total of 24-44 pillars, and has bhate and bosu-bosu (Buton fruit)                           |
| 2  | galampa pangka    | Royal terrace official house, two to four floors, two-tiered roof, a total of 16 pillars, and has bhate and bosu-bosu (Buton fruit)          |
| 3  | bhanua ogena      | two to four story buildings, only one roof stacked, a total of 16 pillars, and has a bhate (attic wing of the house)                         |
| 4  | bhanua            | A two-story house with only one roof with only 9 pillars in total without variations like other types of houses                               |

Pictures of each of the Buton traditional houses can be seen in Figures 1, 2, 3, 4, and 5 below

![Figure 1. Kamali](image1.png)
![Figure 2. Malige](image2.png)
![Figure 3. Galampa pangka](image3.png)
![Figure 4. Bhanua ogena](image4.png)
![Figure 5. Bhanua](image5.png)

**Table 2** Comparative ethnomathematical concepts in the traditional house of buton

| No | Object 1       | Object 2       | Comparative | Description And Meaning                                                                 |
|----|----------------|----------------|-------------|----------------------------------------------------------------------------------------|
| 1  | Door width     | Stair width    | 80: 90      | To be roomy to enter the house                                                          |
| 2  | House width    | Tutum bu height | 100: 35     | Wider body than neck                                                                   |
| 3  | Height walls   | Tutum bu height | 200: 250    | Taller than the neck                                                                    |
| 4  | Height bathe   | length limana bathe | 50: 75 | for maximum storage                                                                   |
| 5  | Front wall height | Side wall height | 200: 150 | Adjusted to the height of the owner of the house                                        |
| 6  | Stair post height | The length of the angle of the stairs | 20: 17/18 | Ladder slope 30° – 75° (ideal)                                                         |
| 7  | Length walls   | Pole height    | <200: >300  | The width of the door is adjusted to the wife's body circumference to be safe           |
| 8  | door width     | Wife's circumference | 1: 1 | Forming a slope angle of 30° - 75° making it ideal and comfortable to use               |
| 9  | Height under the house | Distance from the bottom of the stairs to the house | 200: 180 |                                                                                         |

3.2 Comparative ethnomathematical concepts in the buton traditional house

Comparison or ratio in mathematical concepts is the difference or difference of two or more values by following a certain similarity pattern. Comparisons can be written as fractions or in ratio signs (:). In calculating the ratio of two or more of these quantities, the units used must be the same. From
observations, measurements, and interviews with several informants, it was found that the concept of comparison was very much applied in building the Buton traditional house. The comparative concept used in building the Buton traditional house can be found in several parts of the Buton traditional house as presented in the following table 2.

3.3 Discussion
Further explanation of all the ethnomathematical comparisons in the Buton traditional house is presented below.

3.3.1. The ratio between the width of the door and the width of the stairs. The ratio between the width of the door and the width of the stairs used is 80: 90, i.e. if the size of the body circumference of the wife of the owner of the house is 80 cm, then the width of the stairs is 90 cm, here the width of the stairs is always 10 cm wider than the width of the door to facilitate the movement of residents or guests when entering the house or leaving the house when climbing or descending stairs.

3.3.2. Comparison between the walls of the house and the tutumbu (the great pillar of the house). The ratio between the height of the wall and the tutumbu is 2: 2.5 m. This is the same statement expressed by the informants. This comparison size is for a standard size house with only one roof. If the house is made bigger then the size of the walls and tutumbu will also be bigger but in this case, the size of the tutumbu is more than 3 m for a one-story roof house and 4.5 – 5 m for a two-tiered roof house. Meanwhile, the height of the house pillars is 3.5 – 4 m measured from the sandi (the foundation stone for the house pole) to the top wall clamp. This is understandable because if the height of the pillars of the house) is 1.5 m and the height of the walls is 2 m, then the total is 3.5 m according to the size of the intended pillar of the house. This comparison is a standard measure of the height of the walls and tutumbu in the Buton traditional house. Although by using a unique calculation, namely by using the height the result is almost the same as the wall height of about 2 m and for simplification, a standard height of 2 m is used because it is measured from body height plus one upper arm when standing. Look at Figure 6.

![Figure 6](image_url)

**Figure 6.** The size of the wall height of the house is based on the height of the wife (house owner)

In Figure 6 it can be seen that the size of the wall height of the Buton traditional house is measured based on the height of the owner of the house (wife), namely (1) from the back heel to the nose, or (2) from the back heel to the mouth, or (3) from the back heel to the stomach. These three measurements have different meanings and indicate how well the livelihood of the homeowner and his family while occupying the house. The accuracy of this measurement has an impact on the safety and happiness of
the homeowner while occupying the house. Based on the explanation above, it appears that the size of
each house in Buton is not the same or very diverse because it depends on the size available to the
owner of the house, both the wife for wall height and pole height (ariy), and door width and husband
for door height and ariy height. Of course, with the current standard measurement tools, measuring all
parts of the Buton traditional house, including measuring the height and body circumference of the
owner of the house, is easier to do. Both types of measurement techniques certainly have their
respective advantages. If you use a standard measuring instrument such as the meter, the height of the
Butonnese traditional house will be the same. This adds a positive side, namely the uniformity of
shape and size. However, if you use a unique calculation using the body size of the homeowner, the
size of the house-made will be under the size and comfort of the homeowner. Thus, these two
techniques can be combined, namely using standard measuring tools that are currently available so
that the size is right and can easily be adjusted to the right size of the homeowner.

3.3.3 Comparison of the width of the house and tutumbu. The ratio of the width of the house and the
tutumbu is 100 : 35 cm. This means that if the width of the house is 1 m, the height of the tutumbu is
35 cm. If the width of the house is 7 m, then the height of the tutumbu is 245 cm or 2.45 m. Another
comparison for the height of the tutumbu and the width of the house (counting with limana bhate) is
the height of the tutumbu = 1/4 of the width of the house. So, if the width of the house is 8 m (counting
with limana bhate), then the height of the tutumbu is 1/4 × 8 = 2 m. The two comparison values are the
same. The difference that occurs is only because of the additional size (limana bathe, attic on both
wings of the house) which are 75 cm long each so that because there are two, the limana bathe is 1.5 m
long and each is 50 cm high.

3.3.4. Comparison of wall and pillar heights. Wall height 2 m, pole height (ariy) 3 m (complete
height from the code to the top of wall clamp). So the ratio of the height of the wall and the height of
the pole is 2 : 3 m.

3.3.5. Comparison of the height of the bhate and the length of the limana bathe. As explained earlier
that one of the characteristics of the Pangka house or the official terrace of the palace is the presence
of a bhate (attic wing of the house). This bhate has a certain size that shows the authority of the owner
of the house and also at the same time beautifies and balances the position of the house when viewed
from the front. The comparison in this bhate is the height of the bhate compared to the length of
limana bathe = 50: 75 cm. Bhate is used as a storage area on both sides of the house so it is very
important to pay attention to its size so that it can be used optimally by the owner of the house.

3.3.6. The ratio of the height of the front wall to the height of the side walls. As previously explained,
the height of the walls of the Buton traditional house is about two meters. The height of the wall in
question is the front, middle and back walls measured from kai/ kantaburi (bottom wall clamp) to the
mark. While the size of the wall height on the side of the house is 200 – 50 = 150 cm or 1.5 m. This 50
cm deduction is based on the height of the bhate 50 cm from the markdown as described previously.
That is, even though the house is not an official's house, but every house on stilts in Buton seems to
still be prepared for this bhate section with the size as described (high bhate 50 cm and length of the
arm of bhate 75 cm). In addition to these benchmarks, the sidewall height of 1.5 meters can also be
seen from the body size of the wife of the owner of the house from the feet to the armpits (under the
base of the arm of bhate). So, the ratio of the front wall height to the sidewall height is 200: 150 cm.

3.3.7. Comparison of the width of the stair post with the size of the rungs of the stairs. The comparison
of the width of the ladder pole with the size of the rung of the ladder is the ratio between the width of
the ladder and the size that causes the ladder to be parallel to the ground to make homeowners
comfortable when using the ladder with a ladder slope of 400-750 which is at an ideal ladder slope
interval. and comfortable for all users of the stairs. The ratio in question is 20: 18 or 200: 180 as a
standard comparison measure to calculate the slope of the stairs used by the Buton community.
Through this comparison, it can be seen how long the stairs are and how many steps can be made. The
detailed calculation of the comparison can be seen in table 3.
Table 3 Use of the comparison concept in calculating the slope of the stairs and the number of steps.

| No | The height of the house from the ground to the first floor | Approximate ladder length (Pythagoras) | The distance between the house and the lower end of the staircase | Estimated number of stairs (odd) | Stair slope |
|----|----------------------------------------------------------|---------------------------------------|---------------------------------------------------------------|---------------------------------|------------|
| 1  | 250 cm                                                   | 336.34 cm                            | 225 cm                                                       | 9 or 11                         | 40° - 75°  |
| 2  | 200 cm                                                   | 269.07 cm                            | 180 cm                                                       | 7 or 9                          | 40° - 75°  |
| 3  | 175 cm                                                   | 235.44 cm                            | 157.5 cm                                                     | 5 or 7                          | 50° - 75°  |
| 4  | 150 cm                                                   | 201.80 cm                            | 135 cm                                                       | 5 or 7                          | 50° - 75°  |

Based on table 1, it can be seen that there is a consistency of the Buton people in determining the number of stairs, which is always an odd number. This is so that the owner of the house after trying will always get sufficient sustenance, comfort, safety, and happiness after occupying the house.

3.3.8 Comparison of wall height and house pole height. The comparison intended in this section is the ratio of the height of the wall and the height of the pillars measured from the sandi (the foundation stone of the house) to the tananda (top wall clamp). This comparison needs to be considered to increase the accuracy of other calculations in the manufacture of traditional Buton houses. The ratio of the height of the wall and the height of the pile is 200: 350 cm.

3.3.9. Comparison of the shape of a right triangle formed by a crutch(konta), a pole (ariy), and a buffer (tadha). It is important to explain that these three parts of the Buton traditional house (konta, ariy, and tadha) are the key to the strength of the Buton traditional house because these three parts form the term of right house (bhanua tadha) as the name of the Buton traditional house. In order to support the konta more strongly to withstand the load, tadha is used. The series of poles, konta and tadha form a right triangle, because it consists of three sides that intersect at right angles to each other. A detailed explanation of the relationship of konta, tadha, and ariy can be seen in Figure 7.

Figure 7 shows the relationship between konta, tadha, and ariy and that the relationship between these three parts forms a right triangle with tadha being the longest side (the hypotenuse), while some of the ariy and konta are the right sides. The length of the side of the elbow on the ariy must always be longer than the side of the elbow on the konta, this is intended to strengthen or maximize the strength or function of tadha in supporting konta, ariy, and tadha. Itself and of course indirectly also supports the top of the house. To increase the strength of these three parts, tadha, konta, and ariy, the same type of wood is used.
According to parents in Buton, ariy, konta and tadha must be of the same type of wood. They explain that pemali uses wood that is not of the same type to be assembled for the same purpose or to link them in a unified structure. Scientifically, this local Butonese wisdom makes a lot of sense because each wood has different characteristics, especially in terms of the expansion and shrinkage of the wood. This expansion and shrinkage of the wood are felt when there is a change in seasons, for example in summer (dry) wood shrinks, and in winter (rain) wood expands. If the three parts, tadha, konta, and ariy are not the same type of wood, then, of course the rain will be dense (cold), the wood will expand, and there will be looseness of the wood of konta, tadha, and ariy in the summer (dry), the wood shrinks. Each wood has a different rate of expansion and contraction. This will cause slack at the meeting of konta, ariy and tadha so that if you install different types of wood, it will affect the strength of the house's pillars. The length of the main pillar of this house is 3.5 – 4 meters with a width varying between 13 × 13 cm to 15 × 15 cm, depending on the condition of the wood obtained.

The comparison of these three parts of the house also confirms the fact that the Butonese have practiced the Pythagorean triple concept without first studying or being taught in formal educational institutions. The Pythagorean triple is meant to be a ratio between crutch, pole, and buffer which is 3: 4: 5 or 60: 80: 100 cm. The existence of this comparative concept, especially the role of the Pythagorean rules in building the Butonese traditional house, shows that the Butonese community has practiced mathematics well, thoroughly, and consistently in constructing the Butonese traditional house. The concept of comparison is still used in shaping the construction of any type of house in Buton. For the people of Buton, the house reflects the owner so that the size and shape of the house and its variations indicate the status and existence of the owner of the house. For example, an official's house must have an attic wing of the house called a bhate. As a human being in his position as an official, the attic of the wing of the house shows the standing position of the owner of the house with his hips, bhate is interpreted as the hands and positions of the hands of officials who are on the waist so that his house must have a bhate. This is different from the house of ordinary people who are not allowed to have a bhate on the side of the house because in a normal human sense it is not natural to turn on the waist.

Based on the description above, it can be said that there are indeed differences in ethnomathematical characteristics between Buton traditional houses. The differences in ethnomathematical characteristics that can be quickly seen are the ratio of the size and area of the house, the arrangement of the roof, the number of pillars, and the number of windows used.

Based on the description above, it can also be seen that the Butonese community has been practicing mathematical activities such as counting, measuring, placing, designing, playing, and explaining the meaning of every part or size in the Buton traditional house. The human activity that is in contact with the form of culture is a phenomenon of fundamental mathematical activity [13]. The cultural activity of the Buton people in expressing their mathematical practice to build a traditional house can be called an ethnomathematical activity. Ethnomathematics is a field of study which examines the way people from other cultures understand, articulate, and use concepts and practices which are from their culture and which the researcher describes as mathematical [14]. The concept of comparison in some parts of the traditional Buton house can be used as a context in teaching mathematics at school. It is important to pay attention to maximizing the inheritance and preservation of local wisdom to the next generation of the nation while at the same time attracting the attention of students to learn because the situation presented by the teacher is not foreign to students, the situation in that context is related to the daily life of students. This interest can be used to challenge students' mathematical thinking skills to a higher level in addition to training students' mathematical literacy skills. The application of ethnomathematics is very important in learning mathematics because it can increase motivation, scientific thinking skills and increase students' insight into the culture and local wisdom in their environment [15].
4. Conclusion
Based on the description above, it can be concluded that the concept of comparison is very important in building the Buton traditional house because it has several meanings whose sizes are adjusted to the height of the owner of the house. The concept of ethnomathematical comparison can be found in several parts of the Buton traditional house, namely between: (1) the width of the door and the width of the stairs, (2) the walls of the house and the tutumbu, (3) the width of the house and tutumbu, (4) wall and pillar heights, (5) the height of the bhate and the length of the limana bathe, (6) the height of the front wall to the height of the side walls, (7) the width of the stair post with the size of the rungs of the stairs, and (8) wall height and house pole height, and (9) the shape of a right triangle formed by a crutch(konta), a pole (ariy), and a buffer (tadha). These comparisons can be used as a context in learning mathematics to pass on the ethnomathematical local wisdom of the Buton traditional house. The concept of comparison inherent in the Buton traditional house can be used or developed as a context in learning mathematics, especially to practice counting skills, concepts of fractions, and comparisons.

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6. References
[1] B. Setiawan, D. K. Innatesari, W. B. Sabtiawan, and S. Sudarmin, “The development of local wisdom-based natural science module to improve science literation of students,” Jurnal Pendidikan IPA Indonesia, vol. 6, no. 1, pp. 49–54, 2017.
[2] D. A. Kusuma, D. Suryadi, and J. A. Dahlan, “Improving external mathematical connections and students’ activity using ethnomathematics,” Journal of Physics: Conference Series, vol. 1157, no. 3, p. 032120, 2019.
[3] A. Imswatama and H. S. Lukman, “The Effectiveness of Mathematics Teaching Material Based on Ethnomathematics,” International Journal of Trends in Mathematics Education Research, vol. 1, no. 1, pp. 35–38, 2018.
[4] M. Rosa, L. Shirley, M. E. Gavarrete, and W. V Alangui, Ethnomathematics and its Diverse Approaches for Mathematics Education. Springer, 2017.
[5] D. A. Kusuma, S. P. Dewanto, B. N. Ruchjana, and A. S. Abdullah, “The role of ethnomathematics in West Java (a preliminary analysis of case study in Cipatujah),” Journal of Physics: Conference Series, vol. 893, no. 1, p. 012020, 2017.
[6] A. Q. Fouze and M. Amit, “Development of mathematical thinking through integration of ethnomathematical folklore game in math instruction,” Eurasia Journal of Mathematics, Science and Technology Education, vol. 14, no. 2, pp. 617–630, 2018.
[7] S. P. Nur, Kartono, Zaenuri, S. B. Waluya, and Rochmad, “Ethnomathematics Thought and Its Influence in Mathematical Learning,” MaPan, vol. 8, no. 2, pp. 205–223, 2020.
[8] R. Richardo, “Peran Ethnomatematika Dalam Penerapan Pembelajaran Matematika Pada Kurikulum 2013,” LITERASI (Jurnal Ilmu Pendidikan), vol. 7, no. 2, pp. 118–125, 2017.
[9] E. Fajriyah, “Peran etnomatematika terkait konsep matematika dalam mendukung literasi,” PRISMA: Prosiding Seminar Nasional Matematika, vol. 1, pp. 114–119, 2018.
[10] Marsigit, R. Condromuki, D. S. Setiana, and S. Hardiarti, “Pengembangan Pembelajaran Matematika Berbasis Etnomatematika,” in Prosiding Seminar Nasional Etnomatnesia, 2018, pp. 20–38.
[11] Ajmain, Herna, and S. I. Masrura, “Implementasi Pendekatan Etnomatematika Dalam Pembelajaran Matematika,” SIGMA (Suara Intelektual Gaya Matematika), vol. 12, no. 1, pp. 45–54, 2020.
[12] M. B. Miles, A. M. Huberman, and J. Saldana, *Qualitative Data Analysis, A Methods Sourcebook*. USA: SAGE Publications, Inc, 2014.

[13] A. Bishop, “Cultural Conflicts in Mathematics Education: Developing a Research Agenda.,” *For the Learning of Mathematics*, vol. 14, no. 2, pp. 15–18, 1994.

[14] W. . Barton, “Ethnomathematics: Exploring Cultural Diversity in Mathematics,” University of Auckland, 1996.

[15] A. Imswatama and I. Zultiar, “Etnomatematika: Arsitektur Rumah Adat di Sukabumi sebagai Bahan Pembelajaran Matematika di Pendidikan Dasar,” *ARITHMETIC: Academic Journal of Math*, vol. 1, no. 2, pp. 119–130, 2019.