Teaching Mathematics in Elementary School Using Ethnomathematics of Malind-Papua Tribe Approach

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Abstrak

Salah satu suku terbesar di wilayah selatan Papua adalah suku Malind. Suku ini memiliki sistem bilangan yang dapat digunakan sebagai perantara untuk memahami matematika formal. Penelitian ini bertujuan mengeksplorasi bilangan asli suku Malind, kemudian membuat pola dari segi bahasa, mengidentifikasi bilangan dasar dan selanjutnya memanfaatkan dalam pembelajaran matematika di sekolah dasar khususnya konsep penjumlahan. Penelitian ini menggunakan metode kualitatif. Data dikumpulkan menggunakan teknik observasi, wawancara dan studi literatur. Subjek penelitian ini adalah tokoh adat, kepala kampung, masyarakat suku Malind. Hasil penelitian menunjukkan bahwa bilangan asli suku Malind menggunakan bilangan dasar satu (*hyakod*), dua (*inah*) dan lima (*laghr sangga*). Membilang angka satu sampai empat menggunakan bilangan dasar satu dan dua, sedangkan untuk membilang angka enam (*laghr sangga hyakod*) dan seterusnya menggunakan bilangan dasar satu, dua dan lima. Numerasi suku Malind ini dapat digunakan untuk mengajarkan konsep penjumlahan dengan bantuan media balok bilangan. Dengan memanfaatkan pengetahuan tradisional, siswa diharapkan mampu memahami konsep matematika dengan baik.
Kata Kunci: pembelajaran, matematika, etnomatematika, sekolah dasar

Abstract

One of the largest tribes in the southern region of Papua is the Malind tribe. They have a number system that can be a link for understanding formal mathematical concepts. This study aims to explore the indigenous number of the Malind tribe, then make patterns in terms of language, identify basic numbers and their use in mathematics learning in elementary schools, especially the concept of addition. The research method used is qualitative. The subjects researched are the men of the traditional, village chief and the people Malind tribe. Data were collected using observation, interviews, and literature study techniques. The results showed that the numeric of the Malind tribe used the base numbers one (hyakod), two (inah), and five (laghr sangga). Counting numbers one to four uses the base numbers one and two, while to count six (laghr sangga hyakod) and so on uses the base numbers one, two, and five. Number system can be used to teach addition concepts assisted blocks media. By using traditional knowledge, students are expected to be able to understand the concept of mathematics well.
Keywords: teaching, mathematics, ethnomathematics, elementary school.

INTRODUCTION

One of the reasons why learning mathematics is so important is the ideas, topics, and themes that are relevant to current and future student needs (Rosa & Orey, 2016). Learning mathematics is not only for understanding concepts but also how these concepts can be used for certain activities (Ackland, 2014)**.** Mathematics learning should be able to bridge mathematical concepts in schools with real-life that is rich in culture and civilization. Experience and knowledge of this culture can be implemented in culturally responsive learning (Nyoni, 2014).

Ethnomatematics is part of students' daily lives, which is the initial conception that has been owned by the local socio-cultural environment (S. Sirate, 2012). The integration of ethnomathematics into the curriculum enables students to reason both sequentially and holistically (D'Ambrosio & Rosa, 2016). Through mathematics students can construct their own knowledge based on their own experiences. Ethnomathematics need to be applied from elementary school age to develop a love for their own culture (Zaenuri et al., 2019). Ethnomathematics is an inseparable part of people's lives so that it becomes an important part to be applied in learning, especially learning mathematics at the elementary school level (Kencanawaty et al., 2020).

The problem encountered by indigenous students is the difficulty of understanding school mathematics material. This is because there is a discontinuity between cultural mathematics and school mathematics. One of the reasons is because teachers as mathematics teachers may not relate material to their culture (Owens, 2012). The original ethnomathematics practice is no longer used generally in indigenous communities, even though if this is done it will help the teacher to provide understanding to students regarding the mathematics material being taught (Trinick et al., 2015). Learning will be more meaningful if observing or using students' own culture (Az-Zahroh et al., 2019). Teachers need to equip themselves with indigineous numerical knowledge and practice according to local culture This is to make it easier to direct students to school math concepts.

One of the concepts found in culture is the concept of numbers. Numbers are a concept mathematics used in enumeration and measurement. Number material is the first material introduced in elementary school.The number domain is not only the most prominent area in mathematics but also the basic domain of cognition (Bender & Beller, 2018). The symbol used to represent a number is called a number symbol. The number symbol becomes an instrument for communication and thought (Maharaj, 2008). Usually what is introduced first is addition and subtraction. If it has been mastered well, then proceed with the concept of problem solving related to everyday experiences (Civil et al., 2019).

Several prior research has examined the indigenous number system, including the indigenous number system of Arfak-Papua practiced in the field of trade (Haryanto et al., 2017). The indigenous number system of Baduy was practiced in agricultural (Firmansyah & Septiani, 2019). This is different from the results of Maryati & Indra Prahmana (2018) research which found the use of number operations in traditional Javanese games such as *kubuk* and *dhukter*. Prior research has also examined the implementation of the number system in the world of education. For example, an indigenous number system has been developed for numeracy learning for Gusilay tribe women in Senegal (Gerger, 2014). The same is true of the indigenous number system taught using Maori in Wales and New Zealand (François & Kerkhove, 2010). A number of prior research have shown that the indigenous number system can be applied in the world of education, especially in learning mathematics.

Therefore, this research takes the role of improving the quality of mathematics learning by using an ethnomathematical approach, especially for Malind tribe child indigenous. The study of ethnomathematics and ethnoscience on Malind culture has been carried out through the exploration of the musical instrument Tifa (*kandara*) (Fredy, Halimah, et al., 2020; Supriyadi et al., 2019). Some of the mathematical elements found in the Tifa are cylinder elements on the body/centre and frustum of a cone on the tail and head. In

addition, elements of flat shapes were also found in the patterns and paintings of Tifa. The element of ethnoscience is known from the resonance of the sound when beating the drum. However, research on the indigenous number system of the Malind tribe has never been done before so the novelty of this research is the exploration of indigenous number systems to find mathematical elements that can be developed as mathematics learning in elementary schools.

This study aims to explore the indigenous number system of the Malind tribe, then make patterns in terms of language, identify basic numbers and their use in learning mathematics in elementary schools, especially the concept of addition. The Malind tribe as the largest tribe inhabiting the Merauke district of Papua province is unique in terms of the indigenous number system. Numbering activity is shown in counting the number of an object, person or animal. This research is expected to contribute to science in the form of culturally responsive-based contextual mathematics learning materials.

METHODS

The type of research used in this research is descriptive qualitative research with the aim of describing the native Malind-Papua counting methods and then using them for learning mathematics, especially the concept of arithmetic in elementary schools. The approach taken is an ethnomathematics approach, which examines the elements of mathematics in a culture so that they can be used for learning mathematics. Implementation procedure through three stages: (1) preparation, including the activities of composing instruments, selecting locations, and determining informants; (2) implementation in the field, including interacting with informants and collecting data; (3) processing data, including research data analysis. This research was conducted in Merauke district, Papua province for 3 months. The researcher is the key instrument because it is the researcher himself who creates, explores data, examines it, interprets it. The preferred location is mostly inhabited by the Malind people, namely the coastal areas of Buti, Payum, and Lampu Satu. Determination of subjects using purposive sampling technique, those who are considered to have the knowledge or information needed for research. The subjects in this study were the man of traditional, and cultural, a village chief, and the Malind tribe people who live in the three villages.

Data were collected from interview techniques, participatory observation, and literature review. In conducting participatory observation, researchers play an active role in observing activities, because they blend in with what is being studied. Researchers observed the Malind community's counting activities, for example counting the number of fish catches, the number of coconuts, the number of garden products, and other counting activities. Semi-structured interviews were conducted with adat heads, village heads, and several Malind communities. Interviews were conducted more freely so that researchers could dig up data as completely as possible and as deep as possible so that the researcher's understanding of the existing phenomena was in accordance with the understanding of the actors themselves related to basic numbers, pronunciation, and writing methods, and other matters related to the indigenous number system. The results of the interviews were recorded using a tape recorder. Literature reviews are carried out by analyzing and reviewing literature from both journal articles and books containing Malind culture. Triangulation sources and techniques are used for the validity of the research data. Researchers used interviews, observations, and literature reviews to check the truth. In addition, researchers can also use different informants to check the truth of the information. Through various perspectives or views, it is hoped that results that are close to the truth are obtained.

The data analysis technique to be carried out in this study follows the data analysis of Miles and Huberman (Sugiyono, 2015): (1) data reduction, carried out in two steps, namely removing statements that are inconsistent and unrelated to the objectives and direction of the study, and the final step is to organize data to obtain valid data which is the reference in this study. (2). data presentation is carried out using tables making

it easier to understand the Malind number system (3). data verification is carried out to verify or conclude research results through the process of performing the digest of data from observations, interviews, and literature studies that have been reduced and presented previously. Researchers verify statements that are considered important for use in data analysis. Verification of the data is presented in the form of a short and clear sentence statement. The conclusion made in this study is to interpret the data obtained based on the objectives of this study itself.

RESULTS AND DISCUSSION

Number System of Malind Tribe

Counting is an activity to count the number of certain objects. The Malind people show countless activity in determining the number of objects, people or animals. In counting, the Malind tribe recognizes the base numbers one (*hyakod*), two (*inah*) and five (*laghr sangga*).

Table 1. Number System of Malind Tribe

Number	Addition concept	Numeric of Malind
1	1	*hyakod*
2	2	*inah*
3	2 + 1	*inah hyakod*
4	2 + 2	*inah-inah*
5	5	*laghr sangga*
6	5 + 1	*laghr sangga hyakod*
7	5 + 2	*laghr sangga inah*
8	5 + 2 + 1	*laghr sangga inah hyakod*
9	5 + 2 + 2	*laghr sangga inah-inah*
10	10	*inah sangga*
11	10 + 1	*Inah sangga hyakod*
12	10 + 2	*Inah sangga inah*
13	10 + 2 + 1	*Inah sangga inah hyakod*
14	10 + 2 + 2	*Inah sangga inah-inah*
15	10 + 5	*Inah sangga laghr sangga*
16	10 + 5 + 1	*Inah sangga laghr sangga hyakod*
17	10 + 5 + 2	*Inah sangga laghr sangga inah*
18	10 + 5 + 2 + 1	*Inah sangga laghr sangga inah hyakod*
19	10 + 5 + 2 + 2	*Inah sangga laghr sangga inah-inah*
20	10 + 10	*Inah sangga inah sangga*

For example, to count numbers one to four use the base numbers one and two, while to count the numbers six (*laghr sangga hyakod*) and so on use the base numbers one, two and five. This is because the Malind people in ancient times used their fingers to count. If all fingers have been used for counting, the Malind people use the keywords "*laghr sangga*" and "*inah sangga*" (one hand/5 fingers and two hands/10 fingers) to count numbers over ten. Furthermore, to calculate the number 11 and so on, use the multiplication number system by adding it at the beginning or end.

Using numeric malind in addition learning in elementary schools

The aim of ethnomathematics is to recognize that there are different ways of doing mathematics taking into account the knowledge of academic mathematics developed by different sectors of society (Mahendra, 2017). Ethnomathematical learning is very possible a material learned from their culture can generate learning

motivation and understanding of the material by students becomes easier because the material is directly related to their culture which is their daily activity in society (Fajriyah, 2018).

Related to this then, learning mathematics in elementary schools, especially the material of adding numbers, can be explained using the Malind cultural approach. This can help students to understand the concept of addition because almost everyday students use the Malind language in communicating. The teacher can use the block of numbers as a tool in explaining the concept of addition. Block media can be arranged vertically.

The illustration below is the base number in the malind numeric, namely 1, 2, 5 and 10.

| 1 | 2 | 5 | 10 |
| *hyakod* | *inah* | *laghr sangga* | *inah sangga* |
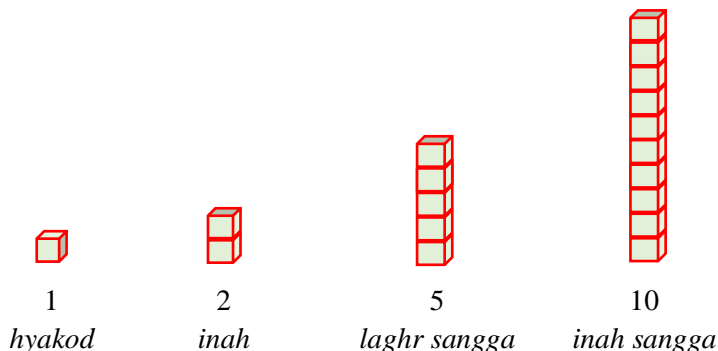
For example:
The number nine is obtained from the sum of 5 + 2 + 2 = 9.

Consider the following illustration:

5 + 2 + 2 = 9
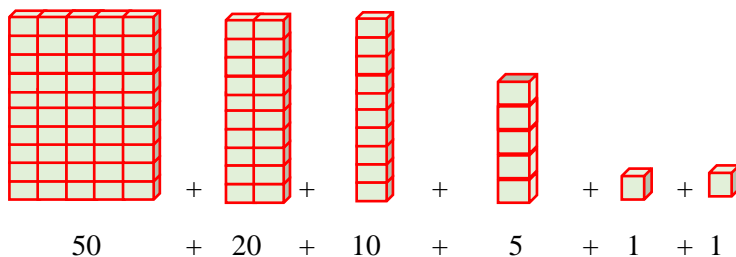*laghr sangga + inah + inah = laghr sangga inah-inah*
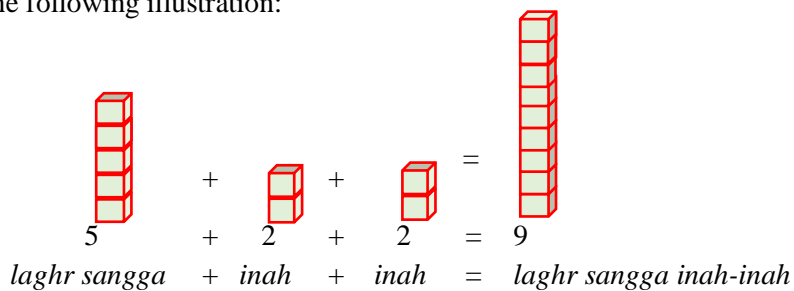
Another example is 23, obtained from the sum of 20 + 2 + 1 = 23. Consider the following illustration:

20 + 2 + 1 = 23
Inah sangga inah sangga + inah + inah = Inah yah sangga inah hyakod
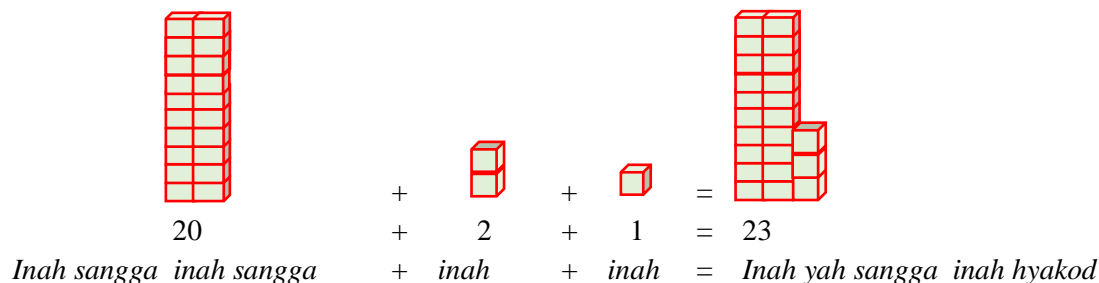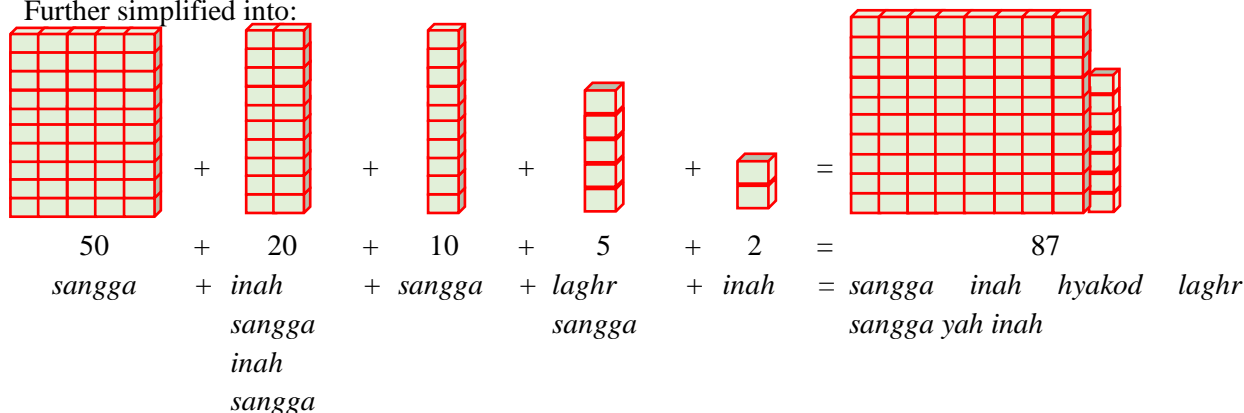
How about adding: 21 + 66 = ... ?
With the help of block media, the solution is:
If you know that 20 + 1 = 21 and 50 + 10 + 5 + 1 = 66, then:

20   + 1 +   50   + 10   + 5   + 1
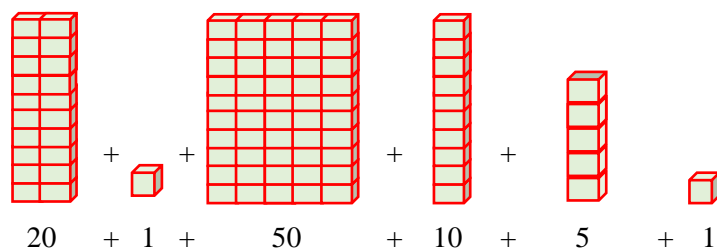
By using the base numbers 1, 2 and 5 and the association properties of the addition are obtained:

50   + 20   + 10   + 5   + 1   + 1

Further simplified into:

| 50 | + | 20 | + | 10 | + | 5 | + | 2 | = | 87 |

sangga   + *inah*   + *sangga*   + *laghr*   + *inah*   = *sangga   inah   hyakod   laghr*
           sangga   *sangga*   *sangga yah inah*
           inah
           sangga
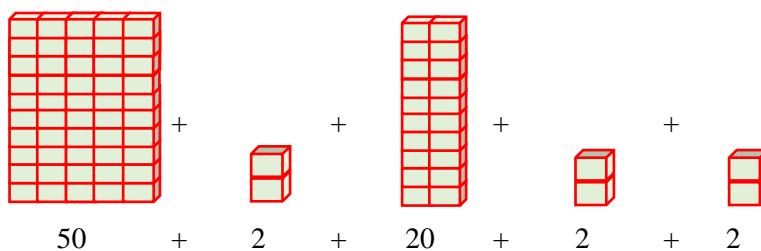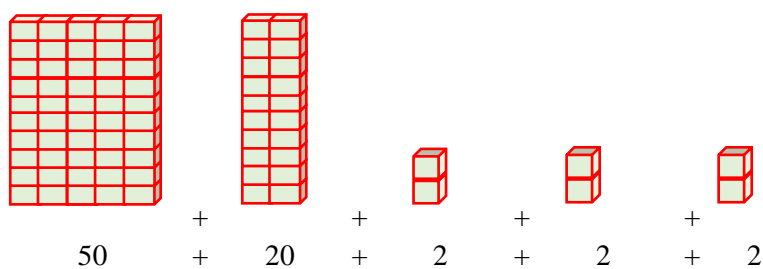
So based on the solution above, it can be concluded that 21 + 66 = 87.
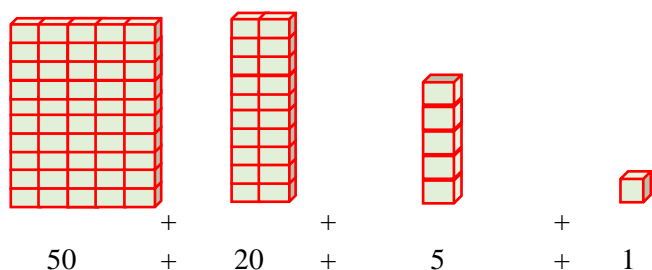The same is the case with the addition of other numbers.

For example 52 + 24 = ...?
Can be completed using block media. Pay attention to the solution below:
If you know 50 + 2 = 52 and 20 + 2 + 2 = 24, then:

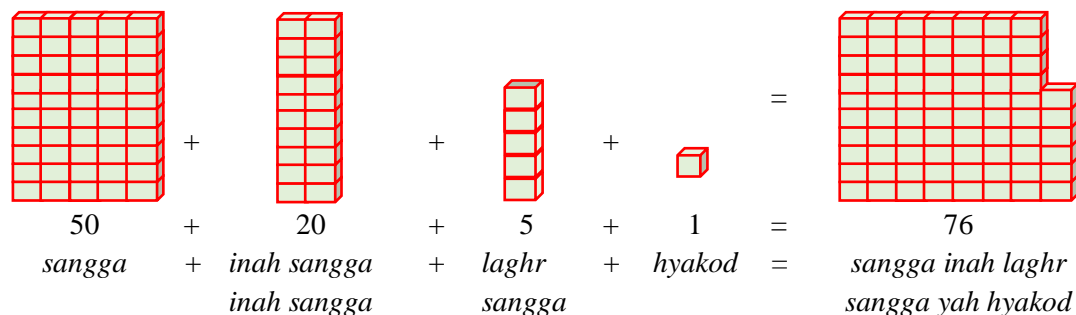50   + 2   + 20   + 2   + 2

By using the association property of addition and the base numbers 1, 2 and 5, it is obtained:

$$50 \quad + \quad 20 \quad + \quad 2 \quad + \quad 2 \quad + \quad 2$$

next:

$$50 \quad + \quad 20 \quad + \quad 5 \quad + \quad 1$$

so that:

50	+	20	+	5	+	1	=	76
sangga	+	*inah sangga inah sangga*	+	*laghr sangga*	+	*hyakod*	=	*sangga inah laghr sangga yah hyakod*

Thus it can be concluded that $52 + 54 = 76$.

One of the mathematics learning theories that can be applied to mathematics learning in elementary schools is Bruner's theory. This theory explains the stages of delivering mathematical material starting from the enactive, iconic, and symbolic stages. In the enactive, the teacher conveys mathematical concepts by providing examples in everyday life. In the iconic, the teacher can use pictures to form a mental image of the students. In the symbolic, the teacher can fill in the number symbols (Bito et al., 2021; Sormin et al., 2017). The findings of this study can be applied in learning to follow the steps of the burner theory. Starting with giving examples of counting the number of objects around students using the indigenous number system, then developing the concept of counting using the media, and finally writing it down in the form of number symbols. Learning that is designed in such a way can activate students and can optimize skills related to cognitive, affective, and psychomotor (Tembang et al., 2019; Prihandoko et al., 2019).

The findings of this study are the indigenous numbers of the Malind tribe which can be used as a material for summation using block media. Considerations using block media because it is easily observed by students when calculating numbers. Most of the media used to construct the concept of adding numbers tends to use number line media. The number line is still abstract as media that is still permanent, so it is not suitable for elementary school students (Suhadak, 2016). The results of the research support the findings of previous studies. For example, the addition operation in determining the birthdays of the Sragen (Aditya, 2018). In addition, the indigenous numbers Arfak tribe can use an *sempoa* (Haryanto et al., 2017). Likewise with the

indigenous numbers *Blijah* in the Madura, namely by fulfilling the first number to the tens number above it (Paul & Sriraman, 2015). The addition algorithm for the indigenous numbers Malind is different from the addition in school. The indigenous numbers Malind has the base numbers one, two, and five as the formers of other numbers.

By knowing the indigenous numbers of the Malind tribe and its application in learning mathematics using block media, it is able to expect overcome the learning difficulties of indigenous Malind in understanding the concept of addition. The results of the research contribute to the development of local culture-based mathematics learning. Not only can help student indigenous understand the concept of formal mathematics but also can preserve culture themselves.

CONCLUSION

Malind numeration uses the base numbers one (*hyakod*), two (*inah*) and five (*laghr sangga*). Counting numbers one to four uses the base numbers one and two, while to count six (*laghr sangga hyakod*) and so on uses the base numbers one, two and five. Malind numeration can be used to teach the concept of addition with block media. By using students' knowledge of numeracy in their own culture (Malind Tribe), students are expected to be able to understand the concept well. In addition, it is expected to be able to preserve the culture of the Malind-Papua tribe. Applying the original ethnomathematics in indigenous people can help the teacher to provide an understanding of mathematics material being taught, so the implication of the results of this study can be used for culture-responsive based especially mathematics learning on additional concepts in elementary schools. Students not only understand the material well but also can preserve their culture. The limitation of this research is this study of indigenous number system Malind tribe is only for learning the concept of addition so that research related to other number operations is necessary.

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