

ETHNOMATHEMATIC STUDY: NUMBER SYSTEM AND CULTURAL MEANING IN THE SASAK TRIBE COMMUNITY

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Submitted: March 27, 2023

Revised: May 30, 2023

Accepted: June 6, 2023

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Abstract

The uniqueness and cultural diversity of traditional communities as reflected in ideas, activities and artifacts can be studied and used as a source of learning mathematics. Most people view that mathematics is not related to culture or is culturally independent. The development of mathematics in society through cultural activities can be studied through ethnomathematics studies that can bring mathematics closer to student culture. Thus, this study aims to explore the number system and cultural meaning that developed in the Sasak people which can be used as a source of learning mathematics on the island of Lombok. This research is a research with ethnographic method. Research data was collected through observation, literature study, and interviews with cultural practitioners, traditional chief leaders, traditional leaders, Sasak cultural researchers and humanists. The results of this study indicate that the development of the number system has been developing for a long time in the Sasak people. Counting activities (*bejinah*) use arithmetic operations as is done in general but with local terms, namely total (*rombok*), less (*sedik*), times (*kali*) and divide (*bagi*). The developing number system is understood as a number in quantitative and qualitative form, in unit or set numbers. There are 5 types of unit or set numbers known by the Sasak people, namely bond units, measuring units for solid objects, measuring units for liquid objects, area units and length units. The mathematical concepts found in the activities of the Sasak people can be used as a source of learning and as a starting point in learning mathematics.

Keywords: number system, cultural meaning, ethnomathematics



1. Introduction

Beliefs and cultural values are two interrelated concepts in human life. Belief refers to a person's belief in the truth or existence of a thing, while cultural values refer to values held by certain communities or groups which are passed on from generation to generation (Wierzbicka, 2007). These two concepts are very important in shaping the identity and behavior of individuals and society. The core values of culture are the guidelines that form the basis for the formation of structures in the form of social institutions and infrastructure in the form of attitudes and behavior in the social life of society. Human growth and civilization in each cultural group is inseparable from the human communication tool, namely language (d'Errico et al., 2018). Language functions to express experience, knowledge, and people's interpretation of their natural environment through symbols. Understanding of sources, patterns or systems, and forms of symbolic thinking in human beings.

Humans who are in cultural groups have developed various ways and techniques to respond and seek explanations about phenomena that occur in an effort to understand the world around them and answer questions about their existence and the universe which is the beginning of their knowledge system. Knowledge systems built by a group of people always use ways and styles that they consider responsive to their own environment (D'Ambrosio, 2016; Rosa & Orey, 2016). Therefore, through observational activities one can compare, classify, evaluate, measure, calculate, and interpret phenomena that occur in each area in cultural activities which are attempts to explain and understand that knowledge. In this case, each culture has a different way of observing, comparing, classifying, evaluating, measuring, calculating, representing, and concluding (Rosa & Orey, 2016).

Cultural values are the result of an abstraction of experience that is difficult to leave even though they mingle with supporters of different cultures. Cultural values as infrastructure have a close relationship with personality in culture (Roe, 2018). All activities of cultural groups ultimately reflect beliefs and values, their feelings about what should be, and differ from what exists in other cultural groups (Foronda, 2020; Lekas et al., 2020; van Prooijen & Song, 2021). Cultural values contained in a group of people play an important role in shaping personality traits in a culture and at the same time provide the basis for individual beliefs, attitudes and behavior (Vaughan & Edwards, 2020). Personality which is the

identity of a cultural group can be seen from various cultural forms such as ideas, activities and artifacts left by their ancestors.

Cultural diversity, as in Indonesia with multi-ethnicity, contact between cultural growth is inevitable. Exchanging, borrowing cultural elements is a common thing. This is reflected in the forms of vocabulary, religion, clothing, and cultural values that provide opportunities for improving the education system, one of which is the mathematics education system which seeks to bring mathematics closer to real experience and culture (Abdullah, 2017). The cultures that exist in each region have characteristics or uniqueness that are used as identities. Uniqueness of this kind can be studied from various perspectives that can be used as a source of learning mathematics, including the cultural uniqueness of the Sasak people on Lombok Island (Fauzi et al., 2021; Fauzi, Hanum, et al., 2022b; Fauzi & Gazali, 2022). The majority of the Sasak people are agrarian people who depend on farming and gardening for their lives. In addition, the Sasak people still preserve customs, traditional arts, traditional settlements and traditions that have been passed down from generation to generation, which can be explored and integrated into learning mathematics. Several studies that examine and explore mathematics in the Sasak culture include (Fauzi, Gazali, et al., 2022; Fauzi, Hanum, et al., 2022a; Hardiani & Putrawangsa, 2019; Novitasari et al., 2022).

In general, ethnomathematics studies on the Sasak people carried out by some of the researchers above, focus on traditional arts, traditional crafts and Sasak culture globally. As studies conducted by Fauzi, Gazali, et al. (2022) explored mathematics in Sasak culture in the study of realistic mathematics. This was continued by Fauzi, Hanum, et al (2022) exploring the idea of mathematics and the value of education in the traditional residential architecture of the Sasak people. Hardiani & Putrawangsa (2019) the tradition of measuring the Sasak people which can be integrated into learning mathematics and Novitasari et al., (2022) explored ethnomathematics in the art of *gendang beleq* for the Sasak people. On the other hand, no one has studied the developing number system and the cultural meanings found in the Sasak people.

The growth and development of human civilization in each cultural group, as happened in the Sasak people, cannot be separated from the main tool of communication, namely language. Language has a function as a means to express experience, knowledge, understanding and interpretation of the environment. Therefore,

language has a close relationship with numbers (d'Errico et al., 2018). Both have similarities that emerge through the process of symbolism and naming. Numbers are one of the manifestations of human active adaptation to their culture. Because in the process of adaptation humans try to recognize, classify, and assess based on the number and quality of each symptom encountered. Numerals that have been expressed through language are then poured in the form of symbols that we often refer to as numbers.

Numbers are symbolic representations of objects. Numbers are the first mathematical ideas used by humans. In this case, the concept of number is almost the first thing that comes to human mind when they hear the word mathematics (Cooke, 2012). Number is a mathematical object that is used to calculate, measure, compare, average, and describe the magnitude of a phenomenon. In addition to their practical uses, numbers have cultural significance around the world. Counting activities in a cultural group is the basis of the number system. Ogomaka (2013) emphasizes that the calculation, formulation and development of any number system is one of the main foundations in mathematics, science and technology.

Based on history, mathematics develops and influenced by strong cultural developments through the formation of symbols, operational processes, and representations in traditional rituals, arts, crafts, and literature (Barton et al., 2006). In another sense, learning mathematics is very influenced by the cultural background of students, so that students in constructing their knowledge cannot be separated from the formal process of daily mathematical activities with mathematics and how they relate mathematics to everyday life through games, drama, and artifacts (Pradhan, 2017). Ethnomatematika is used to make connections between mathematics and culture (Alghar et al., 2022). Connecting mathematical concepts with involving students' local culture is a form of teacher creativity in developing meaningful learning (Acharya, 2020; Milenia et al., 2022). Therefore, the purpose of this study is to explore the number system and cultural meaning that developed in the Sasak people which can be used as a source of learning mathematics on the island of Lombok. In addition, current learning emphasizes the use of technology and local wisdom as part of the learning process.

2. Method

The type of research used in this study is ethnography, where ethnographic research aims to study and describe the culture of a society. (Spradley, 2016). This ethnographic research method was chosen because it is in accordance with the objectives of ethnomatematika, which is to study mathematical ideas, processes, and activities that develop in culture based on the societal point of view (Shirley & Palhares, 2016). In ethnographic research, interpretation of phenomena is the process of describing, analyzing, and interpreting cultural elements such as rituals, customs, behavior, beliefs, and language that develop in these communities from time to time (Spradley, 2016).

The initial stage carried out in this study was observation in various places in the Sasak tribe community, then collecting data on informants who would serve as resource persons with the aim of obtaining valid data.

Data collection was carried out using field surveys and interviews with selected sources based on certain criteria. The resource persons were selected based on their level of understanding of the focus of this research, namely the number system and cultural meanings that developed in the Sasak people. The resource person, Amaq Rijajim, a traditional chief leader, was used as an informant to find comprehensive information about the forms and concepts of counting that developed in the Sasak people. Lalu Ari Irawan, a Sasak *rowot* researcher, was used as an informant in comprehensively exploring the forms of calculating the Sasak calendar. Lalu Agus Fathurrahman, a Sasak traditional leader, was used as an informant to find comprehensive information about the number system that developed in the Sasak people. Raden Gdarip, a Sasak humanist, was used as an informant to find comprehensive information about cultural meanings that developed based on counting activities that developed in the Sasak people and Moch Yamin, a West Nusa Tenggara humanist, was used as an informant to find comprehensive information about the philosophy and symbolic meaning of numbers based on tribal beliefs.

3. Results and Discussion

3.1 Results

The activity of counting in the sense of counting, measuring, and dosaging has been developing for a very long time in human life and it is difficult to know exactly when, by whom, and

how it started. This also happened to the Sasak people.

Counting or *bejinah* (the term of the Sasak people) is an activity to distinguish the number of objects. The concept of quantitative can be understood philosophically which leads to something that can be measured and counted, based on this mathematical concept that developed in the Sasak people leads to a number or quantity that can be operated consistently and remains based on the ways that develop in society.

Referring to the description above, the concept of numbers (principal numbers) that develops in the Sasak people quantitatively is the concept of numbers with a base of 10, namely numbers zero to nine. The mention of each number in the Sasak people varies depending on the regional dialect, especially when mentioning the number one. The principal number referred to in this study is a number order that shows the basic numeration system owned by the Sasak people which serves as the basis for calculating for the Sasak people.

Table 1. Principal numbers

Number	Mention
1	<i>Sak / Sekek / Saik / Sopok</i>
2	<i>Due/Dua</i>
3	<i>Telu</i>
4	<i>Empat</i>
5	<i>Lime/Lima</i>
6	<i>Enem</i>
7	<i>Pituk</i>
8	<i>Baluk</i>
9	<i>Siwak</i>
10	<i>Sepulu/Ahpulu</i>

While the development of the above-mentioned principal numbers is determined by juxtaposing the principal numbers with other principal numbers. For example 11 (*saolas*), 12 (*dueolas*), 13 (*teluolas*) and so on. However, there are several unique terms in the mention of hundreds in the Sasak people, for example: 100 (*satus*), 150 (*karobelah*), 200 (*satak*), 300 (*telungatus*), 400 (*samas*), 600 (*telungatak*), 800 (*domas*). If seen from the mention of the numbers 300 (*telungatus*) or *telu satus* (3 x 100), 600 (*telungatak*) or *telu satak*, indirectly the Sasak people have carried out a number arithmetic operation (multiplication), namely *telu x satak* (3 x 200 = 600), the same as the mention of 800 (*domas*) or *due samas* with the arithmetic operation *due x samas* (2 x 400 = 800). *Berekeng* or *bejinah* is a calculating term for the Sasak people, the concept of counting uses arithmetic operations as used in geometry, namely number or sum (*rombok*), less

(*sedik*), times (*kali*) and divided (*bagi*) (Riajim, 2022).

Qualitatively, the development of the number system can be understood as anonymous from numbers quantitatively, but it is more directed to the existence of a substance. The time of day is divided into several parts based on the mention of each region, such as *dingari* around 01.00 AM, *tengari anjeng* around 12.00, *elek-elek* around 14.00, *bian-bian* around 17.00. The meaning of this time is related to activity time (Yamin, 2022). In addition, the Sasak people are also familiar with the Sasak calendar, which is called the Sasak *rowot*, this calendar is used to determine the planting season for farmers and to carry out customary rituals in general. This date and month and the day chosen are based on calculations using *warige* (determination of good days) (Irawan, 2022). On auspicious day counts, which are carried out by traditional leaders that every remainder of the results of the calculations carried out has a meaning or character that becomes the conclusion of that day. The date and month used is the Hijri month (Gedarip, 2022)

Based on the basic numbers owned by the Sasak people, it has been developed in the form of unit or set numbers. There are 5 types of unit or set numbers known by the Sasak people, namely bond units, measuring units for solid objects, measuring units for liquid objects, area units and length units (Fatrurrahman, 2022).

a. Bond unit

The bond unit (*banten*) is usually used for agricultural products, especially rice and corn. The rice that was planted in the past was *pade jamaq* (feather rice) before the arrival of shorter rice varieties both in terms of the size of the rice stalks and the time of harvest. *Pade jamaq* is usually 6 months old, harvested using a traditional tool called the *rangkapan*. Yields are tied based on the size of the bundle, the term bond used by the Sasak people in general is *seawin* (one bunch the size of one handful of adults), *serêrêk* (two bunches the size of one handful of adults/ *due awin*), *secekel* (three *rêrêk*), *segutus* (two *cekels*) and *sedaut* (twenty *cekels*).

Table 2. Conversion between Volume Measurement Units in the Sasak Tribe Community

Rice bond type	Size(bond)	Size(kg)
<i>Seawin</i>	1 bunch the size of a handful of adults	1-1.25
<i>Serêrêk</i>	2 <i>awin</i>	2-2,5
<i>Secekel</i>	2 <i>rêrêk</i>	4-5
<i>Segutus</i>	2 <i>cekel</i>	8-10
<i>Sedaus</i>	10 <i>cekel</i>	80-100

b. The unit of measure for solids

Agricultural products in the form of grains such as rice, beans and so on, are usually measured using certain quantities that are generally accepted. The measure used by the Sasak people has a different size. These measurements are *kobok* with an estimated weight of 0.5 kg. *Kobok* consists of two types, namely made of coconut shells and made of metal. In addition, the larger size is called *tebong* with an estimated size of 2.5 kg. The measurement using this *tebong* is usually used to measure the weight of rice which is used as *zakat fitrah*.

c. The unit of measure for liquids

In addition to measurements for solid objects, the Sasak people also know that there are measurements for liquid objects such as measurements for oil. This measure is termed *a canting* with an estimated size of 100 ml and a *centong* with an estimated size of 500 ml.

d. Unit area

The ancestors of the Sasak people before using international broad units like right now, they used measurements qualitatively by using certain terms. Terms are usually used for the size of plot rice fields, such as *seanak* or *sekepuri* with an estimated area of 1-3 acres, *sebangket* with an estimated area of 5-7 acres and *sepengengat* with an estimated area of 1 hectare.

e. Length unit

The Sasak people, before recognizing international standard sizes such as milli meters, centimeters, meters, and so on, they used the size (*sikut*) of the human body. The sizes (*sikut*) used are *nyari*, *kepel*, *jengkak*, *hasta*, *depa*, and *perujung*.

Table 3. Conversion between Measurement Units of Length in the Sasak Tribe Society

Size	Estimation (cm)
<i>Senyari</i>	1.5
<i>Sekepel</i>	10
<i>Sejengkak</i>	20
<i>Sehasta</i>	50
<i>Sedepa</i>	150
<i>Seperujung</i>	200

In addition to measurements in the form of grip, measure and length, the Sasak people also recognize odd and even numbers. Even numbers are termed *cukup* while odd numbers are termed *sengga*. The terms *cukup* and *sengga* are not only interpreted as numbers but also have a broad meaning in the life of the Sasak people.

When viewed from the cultural meaning of the units and numbers that have been agreed upon by the Sasak people, they contain values that can be used as part of the form of human relations with humans. These cultural values can be seen in table 4 below.

Table 4. The meaning of numbers in the beliefs of the Sasak people

Mark	Interpretation
<i>Cukup</i>	Besides meaning an even number, the term <i>cukup</i> also shows a form of simplicity, which is reflected in every behavior of the Sasak people Besides having an odd number meaning, <i>sengga</i> also gives an odd meaning to people's behavior that is not in accordance with cultural identity
<i>Sengga</i>	
<i>Jamak-jamak</i>	A form of sincerity if the measurement occurs more or less
1	It has a single meaning, which is a form of the belief of the Sasak people in the creator
3	It means that humans will go through three phases of life, namely the womb, the world and the hereafter.

3.2 Discussion

The science of numbers should be viewed in a broader sense, not only as studied in formal mathematics. Numbers also have a magical, mystical and spiritual significance. The universe is an orderly and harmonious whole with definite proportions. This regular and harmonious relationship with one another has given rise to mathematical strength (Shaughnessy et al., 2021). This concept has been proven by a comparison of weight, length and area. Numbers are a medium of communication between humans and humans, humans and nature and humans and God supernaturally.

Number words experience growth and development, especially after experiencing marking and symbolism which are called numbers. The result of this new symbol has given rise to the science of calculation and measurement (Bender & Beller, 2011).

The Sasak people have long known various forms of units of measurement which are part of the development of numbers. This measurement is a measurement of volume, length and area. There are two measurement methods that are generally used by the Sasak people, namely the grip method and the measuring method as well as measuring

length using anthropometry or human body measurements.

In the measurement method with grip size there are at least 5 types of measurement basis units, which are used, namely *seawin*, *sererek*, *secekel*, *segutus*, and *sedaut*. The syllable *Se* in these terms means one or a/an. So *seawin* can be interpreted as one *awin*. Hand-held volume measurements are generally used for clump-shaped objects, such as rice groves, bean groves, onion groves, and so on.

In addition to the size of the hand as described above, the Sasak people also use measuring as a method of measuring volume. The dosage used consists of a measure for solid objects and a measure for liquid objects. The measurements used for solid objects are *kobo* and *tebong*. *Kobok* is made of coconut shells and metal while *tebong* is only made of metal. The dosage for liquids is in the form of *a canting* for the smallest dose and a *centong* for larger doses. The use of measures with dosage is considered more reliable than using hand measures because measures are units of measurement that are generally accepted and agreed upon.

Galuh/ goar is a term used by the Sasak people refer to area. The size of the area used is the size of *seanak-anak/sekepuri*, *sebangket* and *sepengengat*. This term is the designation for the size of the rice fields. *Seanak-anak/sekepuri* is used to refer to the smallest plots of rice fields, *sebangket* is a designation for plots of rice fields that are larger than *seanak-anak/sekepuri*, while *sepengengat* or as far as the eye can see, is an accumulation of lots of rice fields. As well, the length measurement used is as shown in Table 3. The length measurement used is the size of the human body, which is often referred to as anthropometry. The sizes in question are the size of *a senyari*, *sekepel*, *sejengkak*, *sehasta*, *sedepa* and *seperujung*.

Observing how the Sasak people measure volume, length and area, it can be concluded that the Sasak people already know a number of basic principles in mathematics. At least they are familiar with the concept of units of measurement, the importance of accuracy in measurement, the system of conversion between units of measurement, and the concepts of ratios and comparisons. This is what underlies the formation of human thought patterns and behavior patterns. The Sasak people have known various sizes and measurement methods with their units for a long time. They also understand how to use these units

of measurement in determining the volume, area and length of the object.

The Sasak people already know how important the concept of measurement accuracy. This can be seen from the measurement unit system used and developed. The system of units developed is arranged based on the size of the unit, from the smallest to the largest. Epistemologically, as stated by Ernest (1991) that mathematics is a human activity that involves the solution of a problem. In finding solutions to internal and external problems, the object of mathematics is growing. According to Piaget's constructivist theory, people's actions should be considered as the genetic source of the conceptualization of mathematics. It is easy to say that every human activity always involves mathematics either directly or indirectly. Humans in their lives always use numbers to count, measure and find patterns in the shapes around them. Thus the mathematical concepts that exist at any time in human life are the concepts of arithmetic and geometry.

Cultural activities with their various uniqueness provide a variety of knowledge indirectly, as well as the activities of the Sasak people. The Sasak people are familiar with various forms and patterns of mathematics naturally such as counting, measuring and measuring based on habits with agreed techniques and terms.

4. Conclusion

Ethnomathematics studies are not only aimed at exploring mathematics in culture, but also expected to be included in the mathematics curriculum in the future. Mathematics that develops in society is not only studied through remains in the form of concrete cultural artifacts (such as buildings, motifs, tools, and so on), but also in the form of thinking (reasoning) mathematics that develops in society. In this case, this study reveals that the Sasak people have known and practiced a number of basic mathematical principles that underlie their patterns of thinking and acting in calculating activities.

The concept of numbers that developed in the Sasak people can be seen from their daily activities. Counting or *bejinah* (the term of the Sasak people) is an activity to distinguish the number of objects. There are two counting concepts developed in the Sasak people, namely quantitative concepts and qualitative concepts. The concept of quantitative can be understood philosophically which leads to something that can be measured and counted, based on this the

mathematical concept that developed in the Sasak people leads to a number or quantity that can be operated consistently and remains based on the ways that develop in society. Qualitatively, the development of the number system can be understood as anonymous from numbers quantitatively, but it is more directed to the existence of a substance. Based on the basic numbers owned by the Sasak people, it has been developed in the form of unit or set numbers. There are 5 types of unit or set numbers known by the Sasak people, namely bond units, measuring units for solid objects, measuring units for liquid objects, area units and length units. In addition to measurements in the form of grip, measure and length, the Sasak people also recognize odd and even numbers. Even numbers are termed *cukup* while odd numbers are termed *sengga*. The terms *cukup* and *sengga* are not only interpreted as numbers but also have a broad meaning in the life of the Sasak people. When viewed from the cultural meaning of the units and numbers that have been agreed upon by the Sasak people, they contain values that can be used as part of the form of human relations with humans. Mathematics can be found from various activities of the Sasak people, such as counting, measuring and so on. This kind of activity can be utilized in learning mathematics and used as a starting point in learning mathematics.

Acknowledgements

Thank you to Hamzanwadi University for providing support so that research can be completed as expected. Thank you also to the research team and students who assisted in the research process.

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