

Investigation of mathematical and educational values in the *Bedeyé* tradition within the traditional trading system of the Sasak tribal community

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Abstract

Indonesia boasts a rich and diverse traditional culture, shaped by its historical context, geographic conditions, religious influences, values, and the varied experiences of its people. The distinctiveness and variety of these traditional cultures offer valuable insights and serve as resources for learning mathematics and economics. Common perceptions often dissociate mathematics from everyday activities such as farming, trading, and other practical tasks. This research aims to investigate the mathematical principles embedded in the *Bedeyé* activities within the traditional economic and trade practices of the Sasak tribe. Employing a qualitative research approach with ethnographic methods, data were gathered through observation, literature review, and interviews with cultural practitioners, traditional traders, community leaders, and cultural experts. The research findings reveal that *Bedeyé* activities exemplify traditional barter-based trading practices, where goods are exchanged for other goods. The mathematical concepts identified in the *Bedeyé* tradition include comparative mathematics, set theory, and volume estimation. Moreover, the educational values inherent in *Bedeyé* activities encompass *itiq*, *saling redaq*, *semaiq*, and *saling saduq*. These mathematical principles observed in the traditional trading systems of the Sasak tribe, as demonstrated through *Bedeyé* activities, can be leveraged as educational tools and foundational elements for teaching mathematics.

Keywords: *bedeyé* traditions, economic and trade systems, educational values, mathematics



Introduction

Culture, as a system of knowledge and ideas, exerts an invisible yet powerful influence, guiding human behavior and actions in economic, social, political, and artistic realms based on the values and knowledge inherent in that culture. Humans do not acquire knowledge instantaneously; instead, it is gained through a prolonged and continuous learning process. Learning within a cultural context involves not only the internalization of knowledge passed down through familial inheritance and formal education but also significantly through interactions with the natural and social environment (Tomasello et al., 1993). Therefore, it can be asserted that such interactions are instrumental in imparting new knowledge to individuals.

A significant opportunity for enhancing the education system in Indonesia lies in leveraging the diversity and uniqueness of its cultural heritage, particularly in the realm of mathematical education that integrates the cultural realities of students (Abdullah, 2017). The distinctive and varied cultures of Indonesia can be studied from multiple perspectives, serving as valuable learning resources. For instance, the unique culture of the Sasak tribe offers rich educational content (Fauzi, et al., 2022; Fauzi & Gazali, 2022). The Sasak people continue to uphold ancestral traditions, such as their trading systems, agricultural matching systems, and customs. Each cultural activity is imbued with historical and philosophical values that can shape students as social beings (Widodo, 2019).

Several researchers have delved into the unique aspects of Sasak culture (Kusaeri & Pardi, 2019; Supiyati et al., 2019; Sutarto et al., 2021). Fauzi et al. (2021) investigated mathematical principles in the spatial layout of traditional villages in Segenter, while Fauzi, et al. (2022) explored mathematical ideas and educational values in the traditional architecture of Sasak communities. Further studies by Fauzi, et al. (2022) examined mathematical concepts and cultural values in the Perisean show. Fauzi & Gazali (2022) researched mathematical calculations for determining residential characteristics based on the "*sikut awak*" method. Kusaeri & Pardi (2019) identified mathematical objects within the culture of the Kembang Kerang people of East Lombok. Rizkiwati et al. (2023) explored Sasak local wisdom and its application in financial literacy education within family settings. Additionally, Saprudin (2019) studied the socio-economic impact of the *begawe merarik* tradition on the Sasak Islamic community in Mataram City.

Despite these extensive studies, there remains a gap in examining the mathematical forms inherent in the traditional economic and trade systems of the Sasak tribe. Beyond the Sasak ethnomathematics, other studies in ethnomathematics have been conducted in various regions, as seen in the works of Amsikan & Deda (2023), Mellawaty et al. (2023), and Permita et al. (2022). These research efforts highlight the potential of integrating cultural contexts into mathematical education, thereby enriching the learning experience and making it more relevant to students' lives.

The Sasak tribe is predominantly an agrarian community, with most of the population engaged in farming as their primary source of income. The arrival of Balinese settlers in the 18th century introduced advanced techniques to the Sasak, including the development of irrigation systems, which significantly boosted their economic growth (Parimartha, 2002).

Besides farming, some members of the Sasak community also engage in cattle, goat, and sheep husbandry. While farming and animal husbandry are primarily male-dominated activities, women are mainly involved in weaving.

The Sasak people distinguish between two agricultural seasons: the *taon* season (rainy season) and the *balit* season (dry season). During the *taon* season, they cultivate rice, specifically *pade jamaq* (wet rice). Conversely, in the *balit* season, they grow secondary crops such as corn, beans, and tubers.

Agricultural products, such as rice and nuts, are stored in traditional granaries known as *lumbung*. These granaries vary in terms and shapes across different regions but serve the same purpose. For instance, in Lombok Tengah, they are called *alang*, in East Lombok, they are referred to as *pantek* or *geleng*, and in North Lombok, they are known as *sambi*. These agricultural products are not sold; instead, they are preserved as food supplies for one year, lasting until the next *taon* season. To fulfill needs beyond rice provision, the Sasak tribe employs a bartering system, exchanging goods for goods. This trading practice is termed *Bedeyé*.

Bedeyé is a traditional practice of the Sasak tribe, involving bartering goods rather than using money, and it typically occurs outside of market settings. In this practice, individuals go to locations where they can trade the items they have for items they need. For instance, a person from a coastal area might bring fish to trade for rice or other necessities, while someone from a forested area might bring firewood for the same purpose. This activity focuses more on maintaining appropriate social relationships rather than financial profit and loss. Despite its informal nature, the concept of *Bedeyé* inherently involves mathematical calculations to ensure fair exchanges.

Mathematics is often regarded as a culture-free science (D'Ambrosio, 2019). However, in practice, mathematics serves as a tool for solving real-life problems, making it a cultural product that evolves from various human activities (Bishop, 1979; Bishop, 1988). Ethnomathematics is a field that bridges the gap between culture and mathematics, exploring not only the mathematical concepts inherent in cultural practices but also the cultural values within specific communities (Rosa & Orey, 2021; Shannon, 2021).

Research in ethnomathematics includes studies of buying and selling activities, such as the work by Cipta & Nuka (2023) on the Wulandoni barter market in Lembata, East Nusa Tenggara, and the study by Ohairat et al. (2019) on the whaling culture and barter system in Lamalera Village, Lembata, East Nusa Tenggara. These studies primarily identify mathematical concepts in the form of counting trade activities within barter systems conducted in markets, though they do not always explicitly categorize these as mathematical forms. Incorporating culture into mathematics through ethnomathematics offers a valuable opportunity to align mathematical content with students' cultural backgrounds, thereby enhancing the relevance and accessibility of mathematical education (Amit & Qouder, 2017).

However, many teachers have yet to integrate students' cultural knowledge, which forms an integral part of their initial learning experiences, into formal education. Typically, learning has been conducted in a formal setting, overlooking the wealth of knowledge gained informally

from students' environments and cultures. Students' understanding of formal sciences extends beyond the classroom, as it is also acquired through informal channels within their surroundings and cultural contexts. Therefore, the objective of this research is to delve into the mathematical principles embedded within *Bedeyé* activities within the traditional economic and trade system of the Sasak tribe. By doing so, we aim to bridge the gap between formal education and the rich cultural knowledge of students, fostering a more holistic approach to learning mathematics.

Methods

In this research, ethnography serves as the chosen research method, aiming to examine and portray the culture of the Sasak tribe. Ethnography is a research approach focused on understanding and describing the intricacies of a society's culture (Spradley, 2016). This method aligns with the objectives of ethnomathematics studies, which seek to explore mathematical ideas, processes, and techniques within cultural contexts, viewed through the lens of society (Shirley & Palhares, 2016).

Interpreting phenomena within the ethnographic method involves a systematic process of describing, analyzing, and interpreting elements of a cultural group, including behavioral patterns, beliefs, and language, which evolve over time (Spradley, 2016). Through ethnography, this research endeavors to uncover the mathematical dimensions embedded within the cultural practices of the Sasak tribe, shedding light on the intricate interplay between mathematics and culture.

The focus of this research lies in the traditional trading practices conducted by the Sasak tribe on Lombok Island. Data collection was carried out through field studies and purposively selected interviews with various sources. These sources include the West Nusa Tenggara Cultural Expert, who was consulted to gain comprehensive insights into the concepts and educational values embedded within the trading activities of the Sasak tribe. Additionally, participants of *Bedeyé* activities were engaged to provide comprehensive understanding and insights into the intricacies of the trading system within *Bedeyé* activities.

Cultural Experts from West Nusa Tenggara and East Lombok were also consulted to obtain detailed information regarding the concepts and educational values associated with *bedeyé* activities within the traditional trading system of the Sasak tribal community. Furthermore, a Cultural Expert from East Lombok was engaged to acquire comprehensive insights into the concepts and educational values inherent in *Bedeyé* activities within the traditional trading system of the Sasak tribal community. Through these diverse sources, the research aims to illuminate the nuances of traditional trading practices among the Sasak tribe, uncovering the cultural and educational dimensions intertwined within their trading activities.

To complement the findings from observations and interviews, the researchers conducted a thorough literature review on the traditional economic and trade system of the Sasak tribe. Subsequently, the collected data were subjected to analysis using triangulation techniques, aiming to comprehensively explore the relationship between the mathematical knowledge

system and the educational values inherent in *Bedeyé* activities within the traditional economic and trade system of the Sasak tribe.

Data analysis was conducted through three sequential stages, as outlined by Spradley (2016): domain analysis, taxonomic analysis, and componential analysis. The initial stage of domain analysis aimed to acquire a broad and comprehensive understanding of the research subject, namely *Bedeyé* activities. During this phase, the information gathered provided a surface-level overview, uncovering the domains or categories within the social situation under study.

Following domain analysis, the researchers proceeded to the taxonomic analysis stage, where the identified domains were examined in greater detail. This phase involved describing the domains and delving into their internal structures to gain deeper insights. Lastly, the componential analysis stage involved a thorough examination of each domain's internal structure to identify specific characteristics. This was achieved through contrasting elements within the domains, allowing for a more nuanced understanding of the relationships and patterns observed within *Bedeyé* activities among the Sasak tribe.

Results and Discussion

The Sasak tribe is primarily an agricultural community, reliant on farming as their main source of sustenance. Farming activities are predominantly carried out by men, with women assisting in lighter tasks. However, during intervals between demanding farming activities, women utilize their free time for weaving, known as "*nyésék*." The woven cloth serves not only for domestic purposes within the family but also becomes a valuable commodity exchanged for other necessities during *Bedeyé* transactions. Meanwhile, agricultural products are stored for daily consumption, ensuring the community's sustenance.

In managing agriculture, the Sasak tribe adopts a prioritization system to ensure food sustainability throughout the growing season (Nuraksi, 2023). Within Sasak culture, the concept of "*itig*," meaning thrifty or frugal, holds significance (Yamin, 2023). One of the key agricultural management practices involves the construction of storage facilities known as "*lumbung*," with varying names across different regions. For example, in Central Lombok, it is referred to as "*alang*," while in East Lombok, it is known as "*pantek*" or "*geleng*," and in North Lombok, it is called "*sambi*."

Rice, the staple crop, is divided into three categories: rice for daily consumption, rice for reserves, and rice for seeding purposes. The organization of agricultural products within *alang*, *pantek*, *geleng*, and *sambi*, particularly rice, follows a strategic arrangement based on needs. The front section of the storage facility is designated for rice intended for daily consumption, while the middle part serves as reserves. The back section houses rice seeds and "*inan pade*," which are unhusked rice grains. Additionally, compartments on the left and right sides, known as "*pepare*," are utilized for storing secondary crops, such as nuts. This meticulous organization ensures efficient utilization and preservation of agricultural resources within the Sasak community.

During each harvest season on Lombok Island, a dynamic exchange occurs among its inhabitants. Coastal communities bring forth fish and salt to trade for agricultural produce, while those residing in mountainous regions supply wood from the forests in exchange for crops. Merchants traverse various locations to acquire goods for exchange. This intricate system of trade, known as *Bedeyé*, is a cornerstone of the traditional trading practices of the Sasak tribe. Unlike typical market transactions, *Bedeyé* operates on the principle of exchanging goods for goods, fostering a direct and reciprocal exchange system deeply rooted in Sasak culture.

The *Bedeyé* tradition unfolds from household to household, typically occurring at specific times, such as during the harvest seasons of both rice and secondary crops. Participants bring along daily necessities for exchange, as documented by Nuriah (2023). The transaction process entails the use of traditional measures known as "*takah*," comprising utensils like "*cangkir*" for measuring rice, "*kobok*" for salt, and "*tebong*" for nuts, as described by Suharti (2023). These measurements are often prefixed by "*se*," indicating one unit. The mathematical estimation of the dosage is as follows.

Table 1. Conversion of *canting*, *kobok* and *tebong* measurements

Units of measurement	Conversion in <i>kobok</i> units	Conversion in kilograms	Comparison
<i>Secangkir</i>	$\frac{1}{2}$ <i>kobok</i>	$\frac{1}{4}$ kilogram	The ratio of each component is 1: 2
<i>Sekobok</i>	1 <i>kobok</i>	$\frac{1}{2}$ kilogram	
<i>Setebong</i>	2 <i>kobok</i>	1 kilogram	

The Sasak tribe utilizes specific units of measurement for volume, namely *cangkir*, *kobok*, and *tebong*, which are commonly employed to measure agricultural products such as grains and salt. These units maintain a consistent ratio in size, with the *tebong* unit being twice the size of the *kobok* unit, and the *kobok* unit being twice the size of the *cangkir* unit. This structured formation of units establishes a relationship between each unit, facilitating understanding and calculation. For instance, it can be deduced from this relationship that four *cangkir* units equal the volume of one *tebong* unit. This demonstrates the development of a mathematical mindset within the traditional economic and trade systems of the Sasak people.

In considering the causal reasoning inherent in human thought, individuals indirectly apply logical concepts in mathematics. While there exist diverse perspectives among mathematicians, mathematics itself remains unified. Aristotle and his followers posited that mathematics stems from the practical problems of human life (Anglin, 1994). The integration of culture into mathematics education necessitates a conceptual framework for pedagogical decision-making by teachers, aiding students in understanding how culture intertwines with the learning of mathematics (Orey & Rosa, 2011).

Furthermore, the transaction process in the *Bedeyé* tradition involves the use of bond measures, particularly for agricultural products like rice, corn, and sweet potatoes. These bond measures contribute to the intricate exchange system within the Sasak tribe's traditional trading practices.

Table 2. Bond size

Bond type	Size (bond)	Estimate			Information
		Size (kg) for rice	Corn	Sweet potato	
<i>Awin</i>	1 bunch the size of an adult's handful	1-1.25	-	-	Rice
<i>Rêrek</i>	2 <i>awin</i>	2-2.5	10 heads	-	Rice and corn
<i>Cekel</i>	3 <i>rêrek</i>	6-7.5	30 heads	30 seeds	Rice, corn and sweet potatoes
<i>Daut</i>	20 <i>cekel</i>	120-150	600 heads	600 seeds	Rice, corn and sweet potatoes

Table 2 illustrates the fixed comparison of each bundle within the *Bedeyé* tradition. Each rice bundle is estimated to weigh 5 kilograms at fixed intervals, while bundles for corn are calculated based on the number of cobs of standard size. Similarly, the number of sweet potato seeds determines the size of each sweet potato bundle.

The absolutist perspective of mathematical knowledge rests on two types of assumptions: mathematical assumptions concerning axiom assumptions and definitions, and logical assumptions involving inference rules and formal language syntax (Ernest, 1991). Conversely, the new view posits mathematics as a socially constructed entity, influenced by human experiences and empirical observations. These experiences undergo analytical processing and reasoning, leading to the formation of mathematical concepts that can be understood and manipulated by others. Mathematical language and notation then facilitate the communication of these concepts, which hold universal value (Lovianova et al., 2022). Logic serves as the foundation for the development of mathematical concepts, as they emerge from the human thought process.

In every community activity, particularly those rooted in tradition, cultural values permeate every aspect, including *Bedeyé* activities within the Sasak ethnic community. Furthermore, Table 3 outlines the educational values inherent in this tradition.

Table 3. Educational values in the *bedeyé* tradition

Culture value	Interpretation
<i>Itiq</i>	The Sasak people have the principle that life is not only for today, but there is still tomorrow. <i>Itiq</i> has the meaning of being frugal or living simply, the fortune obtained is used according to needs and not excessively.
<i>Saling Redaq</i>	In the traditional trading system, the Sasak people do not use standard measurements such as scales and so on, but the people use feasibility and agreement. In this way, <i>saling redaq</i> means mutual acceptance if there are excesses or deficiencies in the transaction process
<i>Semaiq</i>	In the process of buying and selling transactions in the form of barter, traders and buyers agree on measurements in the

	form of the number and size of goods to be exchanged. Therefore, <i>Semaiq</i> has the meaning appropriate or sufficient based on the estimates and agreement of the seller and buyer.
<i>Saling Saduq</i>	In the transaction process, sellers and buyers have mutual trust, in other words, no one harms each other.

Table 3 shows that community activities that are part of local community traditions have meaning and philosophy that can be used as part of educational values which are part of the community's identity. The educational values embedded in the *bedeyé* tradition hold significant meaning and philosophy, serving as integral components of the community's identity. These values offer profound insights that can be integrated into the learning process, enriching students' understanding of cultural heritage and promoting cross-curricular learning opportunities. The *Bedeyé* tradition, as a part of the traditional trading activities of the Sasak tribe community, represents a valuable resource for learning mathematics and other subjects, fostering holistic education that encompasses both cultural and academic dimensions.

Conclusion

Studies on community activities extend beyond merely exploring mathematics, economics, and trade systems within the cultural practices of a specific group. The aspiration is for these studies to be seamlessly integrated into every subject taught by educators, enriching the learning process across various disciplines. Despite the inevitable influence of modernization and technological advancements, cultural activities still endure in certain areas of Lombok.

The traditional trading tradition of the Sasak tribe revolves around bartering, wherein goods are exchanged without the use of currency. However, this bartering process differs from conventional market transactions. Instead of trading in designated marketplaces, individuals engage in a practice known as *Bedeyé*, where they visit specific areas to obtain the goods they need, while simultaneously fulfilling the requirements of those in the visited area. This unique tradition underscores the communal nature of trade within the Sasak tribe.

Measurements play a crucial role in facilitating exchanges within the Sasak tribe's trading tradition. Bond measurements such as *awin*, *rerek*, *cekel*, and *daut* are utilized for rice, corn, and sweet potatoes, while grain measurements like *cangkir*, *kobok*, and *tebong* are employed for grains. These measurement units have evolved within the Sasak tribe, reflecting their deep-rooted cultural practices and ensuring fair and equitable exchanges during trading activities.

Mathematical objects are perceived as entities waiting to be discovered, existing independently of human cognition. However, being products of social and cultural constructs, these mathematical objects are deeply embedded within specific worldviews. Their significance lies not only in their mathematical properties but also in the ways they are conceptualized, communicated, and utilized within a particular cultural framework. Consequently, the continued use of mathematical objects serves to perpetuate and transmit these cultural norms and practices.

Moreover, mathematical objects are not merely influenced by social, cultural, or environmental contexts; rather, they actively contribute to the reproduction of these contexts. Culture plays a pivotal role in shaping and facilitating the cognitive processes of the human mind, which in turn generate agreements and conventions manifested through mathematical symbols and signs. Within the context of *Bedeyé* activities, mathematical forms intersect with economic and trading systems, encompassing concepts such as comparison, set theory, estimation of size, profit and loss calculations, and assessment of quantity and quality of goods. The exchange of goods in *Bedeyé* transactions is underpinned by mutual trust and sincerity between parties, encapsulated in the principles of *saling saduq* (mutual trust) and *saling redaq* (mutual sincerity).

Furthermore, *Bedeyé* activities are not solely transactions; they also embody educational values. These values encompass a spectrum of learning experiences, nurturing skills such as cooperation, negotiation, and ethical conduct, thereby contributing to the holistic development of individuals within the Sasak tribe community.

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Conflicts of Interest

The author declares that there is no conflict of interest in writing this article.

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