JPPIPA 12(5) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Reconstruction of Physics Concepts from Indigenous Knowledge in the Sasak *Arak-Arakan Besunat* Tradition Using *Praje* to Support SDG 4 (Quality Education)

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Received: March 27, 2026
Revised: May 05, 2026
Accepted: June 11, 2026
Published: June 11, 2026

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DOI: 10.29303/jppipa.v12i5.15102

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Abstract: This study aims to reconstruct physics concepts embedded in the Sasak *Arak-arakan besunat* tradition using *praje* into formal physics knowledge as a contextual ethnoscience-based learning resource supporting SDG 4 (Quality Education). The study employed a qualitative descriptive method with an ethnographic-ethnoscience approach. Data was collected through interviews, observations and documentation and scientific verification involving traditional leaders, *praje* craftsmen and parents in East Lombok. The data were analyzed through data reduction, identification of indigenous knowledge, scientific verification and reconstruction into school science concepts. The findings show that the tradition contains several contextual physics concepts, including Newton's Laws, center of mass and dynamic equilibrium in maintaining *praje* stability, work and changes in potential and kinetic energy during lifting activities, impulse and momentum in drumstick collisions on *gendang beleq*, sound resonance in traditional musical instruments and uniform as well as accelerated motion during the procession. These concepts are empirically applied in community practices and can be scientifically reconstructed into formal physics learning concepts. The integration of indigenous knowledge has the potential to enhance students' conceptual understanding and cultural literacy through contextual learning experiences.

Keywords: Ethnoscience; Local wisdom; Physics; *Praje*; Procession tradition

Introduction

Local cultural traditions are an important part of a community's identity, including the Sasak ethnic group on Lombok Island, which continues to preserve various traditional rituals to this day. The Sasak tribe is one of the ethnic groups in Lombok, West Nusa Tenggara, that possesses diverse arts, cuisine, and socio-economic lifestyles as distinctive cultural identities that contribute to the cultural diversity of the Republic of Indonesia. Thus, Sasak local culture has become an identity attached to the ethnic community living on Lombok Island and contains various important values, such as religious, social, aesthetic, political, and leadership values that shape the character of its society (Aswasulasikin et al., 2022).

One tangible manifestation of this culture is the procession tradition in circumcision ceremonies, which carries not only social and religious meanings but also local knowledge values (ethnoscience). This tradition is known through the practice of *nyongkolan*, namely the ritual procession of a child who is about to be circumcised by parading him around the village like a king using a *jaran kamput* called *praje*. The implementation of this tradition is accompanied by traditional Sasak *gamelan* music or modern Sasak music *(kecimol)* aimed at creating a joyful atmosphere so that the child does not feel tense during the procession (Azima et al., 2023). The technical difference between

How to Cite:
Adawiah, R., Nakjah, S. N. S., Anggriani, N. K., Surajuddin, & Hadiprayitno, G. (2026). Reconstruction of Physics Concepts from Indigenous Knowledge in the Sasak Arak-Arakan Besunat Tradition Using Praje to Support SDG 4 (Quality Education). *Jurnal Penelitian Pendidikan IPA*, *12*(5), 875–884. https://doi.org/10.29303/jppipa.v12i5.15102

jaran kamput and *praje* also needs to be emphasized. *Jaran kamput* refers to a decorative horse-shaped figure that highlights symbolic and aesthetic values in Sasak traditional performances, whereas *praje* is a carrying or palanquin system designed to support and distribute loads during the procession. Since this study focuses on physical phenomena related to lifting mechanisms, balance, and load distribution, the discussion is directed more toward the structure of the *praje* rather than the decorative aspects of the *jaran kamput*.

From an ethnoscience perspective, traditional cultural practices are not merely viewed as social activities but also contain scientific concepts that develop contextually. This indicates that cultural phenomena can be explained through both scientific knowledge and indigenous science, thereby enhancing students' motivation in reconstructing knowledge. Therefore, ethnoscience has the potential to be implemented in science learning, including physics, chemistry, and biology, as part of more contextual and meaningful learning (Habibi et al., 2023). In the educational context, the integration of ethnoscience into learning, especially physics, is important to bridge scientific concepts with students' real-life experiences. Learning connected to the surrounding environment has been proven to be more effective and capable of increasing students' learning interest because it provides more relevant experiences. In addition, the use of local cultural content in teaching materials is increasingly recognized as an effective approach to improving student engagement and learning outcomes (Dharma et al., 2025; Rahmat et al., 2023).

The Sasak circumcision procession tradition fundamentally involves various activities that can be analyzed using physics concepts, such as motion, sound, force and energy. One important element of this tradition is the *praje*, which functions not only as part of the traditional ritual but also embodies physics concepts, particularly the principles of center of mass and stability. This tradition is still used in various customary activities such as wedding processions and circumcision ceremonies, indicating a relationship between local culture and scientific concepts (Ansumarwaty et al., 2024). Although technically this procession resembles *nyongkolan* in Sasak wedding traditions because both involve accompanying processions with traditional music, the circumcision procession has different ritual meanings and social functions. Therefore, this study specifically focuses on the circumcision procession carried out using *praje*.

However, the physics concepts embedded in this tradition have not been widely reconstructed systematically as contextual learning resources. In fact, misconceptions in physics learning are still commonly found, especially in mechanics and sound waves. In mechanics, students often experience difficulties in understanding concepts such as force, work, equilibrium, impulse, momentum and rotational dynamics because learning tends to be abstract and disconnected from real-life experiences. Meanwhile, in sound wave concepts, students also face difficulties in understanding vibration, resonance, and sound propagation because the material is often taught theoretically without contexts close to their cultural environment. These conditions are influenced by teaching methods, teaching materials, instructional language, and the lack of contextual learning experiences (Resbiantoro et al., 2022; Wulandari et al., 2021). Therefore, a more meaningful learning approach is needed through the integration of local culture and students' real-life experiences so that physics concepts, especially mechanics and sound waves, can be more easily understood conceptually.

Therefore, studies are needed to examine and reconstruct the physics concepts contained in the circumcision procession tradition as a form of integration between modern science and local wisdom. According to Yatim et al. (2025), this integration is becoming increasingly important considering that local identity plays a major role in determining national dignity, while globalization poses challenges to preserving local culture. Furthermore, the educational curriculum in Indonesia has not yet been fully able to optimally integrate local culture into the learning process.

This research is important because it contributes to the development of contextual physics learning resources based on local wisdom while also supporting culturally responsive education. The integration of local knowledge into formal physics learning also provides educational equity for students from local cultural communities because their cultural experiences and community knowledge are recognized as valuable learning resources in formal science education. This is in line with Sustainable Development Goal (SDG) 4 on Quality Education, which emphasizes the importance of inclusive, quality, and contextually relevant education. The integration of local wisdom into ethnoscience-based physics can create contextual and meaningful learning experiences while supporting the sustainable development of students' scientific and cultural literacy. As stated in research conducted by Susilawati et al. (2026), a deep learning approach to physics through constructivism can improve science process skills and scientific attitudes to support SDG 4 Quality Education.

SDG 4 Quality Education is aligned with Vygotsky's educational perspective, which seeks to eliminate educational gaps and ensure equal justice for marginalized groups. This learning perspective is based on individual development and sociocultural contexts, emphasizing fair and student-centered approaches. The focus of SDG 4 Quality Education is on social interaction, cultural relevance, learner independence, and inclusive practices in providing quality, equitable, and meaningful education for all. The SDG 4 agenda highlight the importance of quality, equality, and inclusion influenced by supportive learning processes and environments (Yanuarto et al., 2025). According to Seenuan et al. (2025), community identity, such as traditions, practices, and local resources, can serve as a foundation for creating effective, contextual, and equitable learning because they provide authentic learning experiences closely connected to students' lives.

Thus, ethnoscience-based learning not only improves conceptual understanding but also strengthens students' cultural literacy and appreciation of local wisdom. Based on these considerations, this study aims to identify and reconstruct the physics concepts found in the circumcision procession tradition using *praje* as a contextual ethnoscience-based physics learning resource to support SDG 4 (Quality Education).

Method

This study employed a qualitative descriptive method with an ethnographic-ethnoscience approach (Hall & Liebenberg, 2024; Lim, 2025). This approach was selected because the study aimed to identify indigenous knowledge embedded in cultural practices and scientifically reconstruct it into formal physics concepts (Lim, 2025). The research focused on the arak-arakan besunat tradition using praje in East Lombok Regency, West Nusa Tenggara.

The informants were selected using a purposive sampling technique based on specific criteria relevant to the research objectives, such as *praje* craftsmen with at least 10 years of experience, traditional leaders who are still actively involved in the procession and community members who have participated in organizing the circumcision tradition (Tajik et al., 2024). Data collection involved six key informants consisting of two traditional leaders, two parents who organized circumcision ceremonies, and two *praje* craftsmen. The selection of these key informants aimed to obtain in-depth and relevant information in accordance with the focus of the study (Saharudin, 2021).

Data collection techniques were carried out through interviews, observations and documentation to obtain comprehensive data (Ansumarwaty et al., 2024; Munisah & Prasetyo, 2023). Observations were supported by digital cameras and audio recording devices to analyze physical phenomena such as force distribution, motion and sound resonance in traditional musical instruments. Interview guidelines focused on indigenous knowledge related to the construction of *praje*, procession mechanisms and the use of traditional instruments.

The validation of data and interview instruments was conducted using data triangulation techniques to improve the credibility and validity of the research findings (Lim, 2025; Raehanah et al., 2025). The type of triangulation used was multiple triangulations, which combined various observers, theoretical perspectives, data sources and methodologies. Source triangulation was applied because data were collected from various sources such as *praje* craftsmen, traditional leaders and parents organizing circumcision traditions. Researcher triangulation involved four researchers. Methodological triangulation employed qualitative approaches, namely observation, interviews and documentation. Theoretical triangulation was used during the stage of scientific verification and reconstruction of physics concepts from the circumcision procession tradition using *praje* by physics experts (Vivek et al., 2023). Data collection took place in West Sakra District, East Lombok Regency, from March 28 to April 8, 2026.

The data processing technique was adapted from Batlolona et al. (2026) with the following stages: the data collection stage; data reduction by summarizing and selecting information relevant to physics concepts; the exploration stage of physics concepts through literature studies to explain physics concepts within local culture as well as scientific verification by comparing indigenous practices with formal physics theories; the data presentation (reconstruction) stage in descriptive or narrative form; and the conclusion drawing and recommendation stage based on the research findings. The stages of the research process are presented in Figure 1.

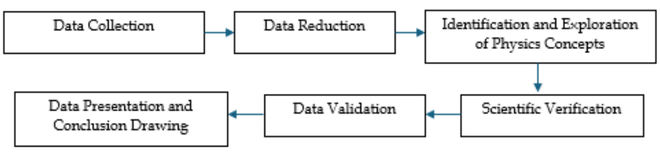

Figure 1. Research flow

Result and Discussion

Local Wisdom and Ethnoscience

Local wisdom is a representation of knowledge formed through the continuous interaction between humans and their environment based on ongoing experiences (Laili et al., 2023). Local wisdom not only reflects valuable cultural heritage but also serves as a source of knowledge encompassing rich moral, social, and cultural aspects (Muliadi & Asyari, 2024). Local wisdom is not merely a cultural element but can also function as a conceptual bridge to help understand science in a more concrete and contextual manner (Rahmawati et al., 2025). Education that integrates local wisdom in the form of local culture and community values is important because it can be preserved and passed down amid modern life, especially in physics learning (Fitriah et al., 2025).

Ethnoscience is an approach in science that focuses on integrating scientific concepts with cultural values and local wisdom (Septina et al., 2025). The ethnoscience approach is understood as the result of empirical experiences within society that can be studied and interpreted scientifically without positioning it as inferior to modern science (Nikmah et al., 2026). Ethnoscience in physics learning, especially ethnophysics, is relevant to cultural contexts because it connects scientific principles with traditional practices. These practices are very important for improving students' critical thinking skills and contextual understanding (Jufrida et al., 2025).

Ethnoscience Analysis of the Praje Procession Tradition

The results of the study and analysis of the *praje* procession tradition indicate the existence of local wisdom values and ethnoscience potential that can be utilized as references in science learning (Amalina et al., 2024). Based on research conducted by Ansumarwaty et al. (2024), there are forms of local wisdom manifested both concretely and conceptually through the construction of praje, the use of *kayu borok* or *sintok wood* and the series of procession rituals carried out by the Sasak community during circumcision ceremonies in Central Lombok. The sequence of these rituals contains many local wisdom values, in which the *praje* used in the procession is created with clear and purposeful intentions, namely, to bring joy to the child being circumcised while also honoring the event organizers (Praditha et al., 2024). The procession tradition in the circumcision ritual of the Sasak community is one form of cultural expression related to the human life cycle (Sirtufillaily et al., 2024). In Sasak society, circumcision is not only regarded as a religious obligation but also as a symbol of a child's transition into adulthood within social life (Nasri et al., 2024). The *praje* is presented based on the aesthetic values of Sasak culture.

The procession activity is carried out collectively by the community, thereby creating a strong atmosphere of togetherness (Nashihah et al., 2023). This tradition not only functions as a celebration but also serves as a form of notification to the community that a child has entered a new stage of life. Thus, this tradition has a social function in strengthening relationships among community members and reflects the value of social solidarity (Renda, 2025). The local wisdom values contained in this tradition include cooperation, social solidarity and cultural preservation. The preparation and implementation of the activity are carried out together by the community, starting from providing *praje*, musical instruments, to the execution of the procession (Solihah, 2023). This shows that the *besunat* procession tradition is part of the cultural identity of the Sasak people, which continues to exist despite social changes due to modernization. The continuity of this tradition demonstrates that local wisdom has adaptive capabilities without losing its cultural values.

Figure 2. Procession activities using *Praje*

Based on interviews and observations, the people involved in this tradition are not consciously aware of the physics concepts contained within it. However, the activities carried out indicate that these practices represent a form of indigenous knowledge (indigenous science) that has developed empirically within the community.

Table 1. Interview results

Physics Concept	Interview Results
Newton's Laws and Dynamic Equilibrium	"…the *praje* procession is carried by four people, while four others act as replacements. When the *praje* is lifted, all carriers must walk in a balanced and coordinated manner (like marching) so that the *praje* does not tilt, especially when the carriers dance following the music rhythm. The height of the carriers is also prioritized to be the same so that it does not become uneven or unbalanced" (AK, April 4, 2026)."…the average child's weight ranges from 20 kg–30 kg and is usually accompanied by their parents who also ride the *praje*. The parents' average weight ranges from 45 kg–70 kg. The *praje* instrument can weigh between 50 kg–100 kg depending on the size of the *jaran kamput* used" (J, April 5, 2026)."…I usually make a *praje* weighing around 50 kg–70 kg. The head length is 45 cm, the body is 1 meter, the tail is 1 meter, the legs are half a meter, the ears are 11 cm,

	and the front part (*bapang*) is 10 cm long" (AMA, April 1, 2026).
Torque and Center of Mass in *Praje* Stability	"…we carry the *praje* at the ends of bamboo poles. If it is held too deep, the weight feels heavier and obstructs the view of those carrying it from behind. Usually, the weight of the *praje* is felt evenly by all carriers (not only by one or two people)" (AK, April 4, 2026).
Work and Energy	"…when lifting the *praje*, the front carriers must crouch first, and the rear carriers quickly lift to adjust the height of the *praje*" (AA, March 28, 2026)."…a tilted position in the procession usually occurs when going uphill. The load felt by the carriers also differs, requiring greater energy" (AK, April 4, 2026).
Impulse and Momentum	"…the sound of the drum must follow the rhythm and not be random. There are times when the drum is beaten strongly and softly depending on the rhythm" (J, March 29, 2026).
Sound Waves	"…the rhythm of the *gendang beleq* indicates festivity in the *besunat* procession using the *praje*, so people in the village or surrounding areas who hear the sound will join in the celebration and come to watch the procession" (J, March 29, 2026).
Kinematics of Motion	"…the procession starts from this village to Toyang village, covering about 2 km, then returns to this village again. So, the total journey is about 4 km. The procession sometimes stops to dance according to instructions from the leader or the owner of the *praje*, so the duration is not fixed" (J, April 5, 2026).

Concept of Newton's Laws and Dynamic Equilibrium in the Procession

The process of lifting and carrying the *praje* demonstrates the application of Newton's laws. However, the condition $\sum F = 0$ during motion must be understood as a simplified physical model, not a perfectly ideal condition. In real situations, kinetic friction, air resistance, and fluctuations in lifting force due to footsteps continuously occur. This *praje* procession tradition is also like the system used in *ogoh-ogoh* performances. As shown in research conducted by Saphira et al. (2022), the lifting of *ogoh-ogoh* also involves the three Laws of Newton. Newton's Laws apply when an object is in motion. Newton's First Law tends to maintain a state of equilibrium. When the carriers shake the statue, Newton's Third Law applies.

Thus, Newton's First Law in this procession is more appropriately interpreted as a condition of dynamic equilibrium, used to explain how the carriers maintain the relative stability of the *praje* while in motion. Research by Putra et al. (2022) explains that equilibrium position is the resultant of forces acting on a system, meaning that the net force is zero.

When the *praje* moves at a relatively constant velocity, the resultant external force can be approximated as:

$$\sum \mathrm{F} = 0 \tag{1}$$

This approach helps explain the static distribution of lifting forces among the carriers. Therefore, it can be written as:

$$\mathrm{N_1 + N_2 + N_3 + N_4 = W_{praje} + W_{child}} \tag{2}$$
$$\mathrm{N_{total} = W_{total}} \tag{3}$$

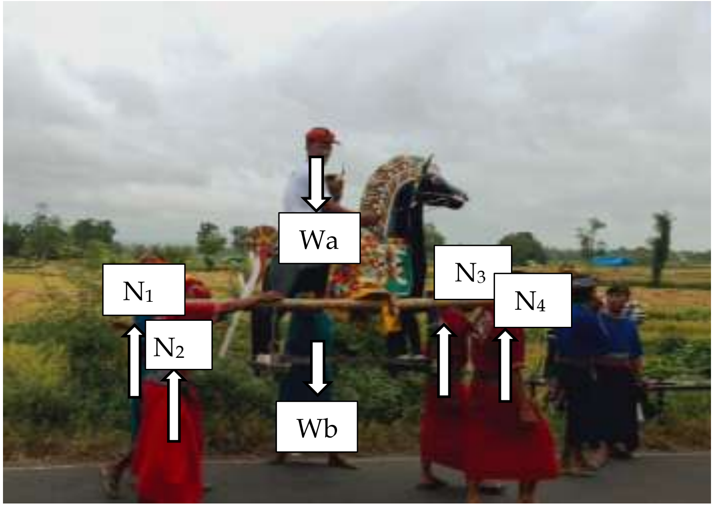

Figure 3. Newton's first law in the *Praje*

The lifting force exerted by the carriers must be equal to the total weight of the system for the *praje* to remain in a state of equilibrium. If the distribution of force is uneven, the *praje* will tilt or become unstable. Newton's Second Law is observed when the procession begins to move, experiences acceleration, or slows down:

$$\sum \mathrm{F} = \mathrm{ma} \tag{4}$$

Which shows that the acceleration of the *praje* depends on the total force exerted by the carriers (Figure 3). In this system, the mass variable (m) refers to the total mass of the system:

$$\mathrm{m_{total\ system} = m_{child} + m_{carrier} + m_{praje}} \tag{5}$$

Thus, the force exerted by the carriers depends on the combined mass of the child and the *praje* structure. In addition, the interaction between the carriers and the prajé also follows Newton's Third Law:

$$\mathrm{F_{action} = -F_{reaction}} \tag{6}$$

Figure 4. Newton's third law during the *Praje* procession

Which means that the force exerted by the carriers on the prajé is balanced by an equal and opposite reaction force from the *praje* on the carriers.

Torque and Center of Mass Concepts in Praje Stability

The carriers' positions are generally fixed near the ends of the bamboo poles. If the forces between the carriers are balanced, then the resultant torque approaches zero:

$$\sum\tau = 0 \tag{7}$$

However, instability may occur due to changes in the carriers' distance from the center of mass (Putra et al., 2022). Conversely, instability occurs when the child changes their sitting position, causing the center of mass to shift and the lifting forces among the carriers to become unbalanced. For example, if the carriers on the left side lift higher than those on the right side, the *praje* will tend to tilt or rotate about a certain point. The cause of this rotational tendency is the presence of torque. Under these conditions, a resultant torque arises:

$$\sum\tau \neq 0 \tag{8}$$

Equation of moments (torque equation):

$$F_1 \neq F_2 \tag{9}$$

As shown in the research by Putra et al. (2022), to achieve dynamic equilibrium, the angular velocity must be constant, and the angular acceleration must be zero. The sum of forces in each axis component must be equal to zero to maintain a balanced and stable condition. In addition, the center of mass is also one of the equilibrium concepts in physics. The concept of the center of mass applies when, during the procession movement, there is a point that supports the total mass of the system.
Center of mass equation:

$$X = \frac{\sum m_i x_i}{\sum m_i} \tag{10}$$

If one of the carriers exerts a smaller force or is not in a balanced position, a moment (torque) will occur that causes the *praje* to tilt. This mechanism of dynamic equilibrium also shows that the local community empirically maintains load stability while moving over uneven surfaces.

Concept of Work and Energy

When the carriers walk horizontally at a constant speed while exerting an upward lifting force, the angle between the force and displacement approaches 90° (Maison et al., 2020). In physics, work only occurs when a force has a component in the same direction as the displacement:

$$W = F \cdot s\cos\theta \tag{11}$$

$$\cos 90^0 = 0 \tag{12}$$

$$W = F \cdot s\cos\theta \tag{13}$$

Therefore, the mechanical work on the load during horizontal movement theoretically approaches zero. In addition, significant physical work occurs when the prajé is lifted from the ground to the shoulders, when the carriers walk uphill, and when the carriers adjust the height of the *praje*.
Kinetic Energy:

$$E_k = \frac{1}{2}mv^2 \tag{14}$$

Potential Energy:

$$E_p = mgh \tag{15}$$

These findings show that energy analysis in this tradition is more appropriately focused on changes in gravitational potential energy and the mechanical lifting process. This is in line with research by Dewa et al. (2026), which states that both types of energy contribute to the application of the law of conservation of mechanical energy.

Concept of Impulse and Momentum in Gendang Beleq

When the drumstick strikes the drum membrane, a rapid change in momentum occurs:

$$p = mv \tag{16}$$

and impulse:

$$I = F.\Delta t = \Delta p\big(m(v_2 - v_1)\big) \tag{17}$$

The collision between the drumstick and the membrane produces vibrations that form sound waves. In this event, there is a transfer of momentum, contact force, and a change in velocity after the impact. The type of collision that occurs in the drum is generally classified as a partially elastic collision because part of the energy is converted into sound and heat energy, while another part becomes the vibrational energy of the membrane. This relationship can be explained by the law of conservation of momentum:

$$m_1v_1 + m_2v_2 = m_1v_1{}' + m_2v_2{}' \tag{18}$$

The shorter the collision time, the greater the force produced during the impact. When the stick hits the drum surface, it exerts a large force in a short amount of time so that the drum membrane receives an impulse as a result, the membrane's momentum changes and it begins to vibrate, producing sound. The stronger the strike, the greater the force generated, the greater the impulse, the larger the amplitude, and the louder the drum sound will be. This is supported by the research of Rizki et al. (2022), which states that the concepts of momentum and impulse are characterized by collisions, changes in momentum, and impulse. The change in momentum begins from a state of rest (P = 0) and then changes due to a collision (P > 0).

Concept of Sound Waves in Gendang Beleq

In the *besunat* procession tradition, the sound produced by the *gendang beleq* comes from the vibration of the circular membrane and the resonance of the air column inside the wooden body of the drum (Khotimah et al., 2015). The wooden body of the *gendang beleq* functions as an air column resonance chamber that amplifies the sound produced by the vibration of the drum membrane. When the membrane is struck with a beater, it vibrates and produces sound waves. These vibrations then cause the air inside the drum cavity to vibrate, creating resonance that makes the sound louder and clearer during the procession. The larger the air cavity in the drum body, the lower the frequency of the sound produced and the stronger the resonance tends to be. However, the main source of sound in the *gendang beleq* comes from the vibration of the circular membrane stretched across the drum surface. The frequency of the sound produced is influenced by membrane tension, membrane density, and membrane diameter (Rahman et al., 2021). Therefore, the physics concepts in the *gendang beleq* can be explained through a combination of circular membrane vibration and air resonance inside the wooden drum body.

Equation of transverse sound waves:

$$y = A\sin(kx - \omega t) \quad (19)$$

The cylindrical wooden shape of the drum functions as a resonator that amplifies sound through the phenomenon of resonance. This shows that the community empirically understands the use of the acoustic properties of materials in the making of traditional musical instruments. The resonance frequency is influenced by membrane tension, membrane diameter, the dimensions of the air cavity, and the properties of the wood material.

Concept of Kinematics of Motion

In the *besunat* procession tradition, the participants of the custom *(sekahe)* who carry out the procession depart from the house of the circumcised child, move to the procession destination and then return to their home. This indicates the presence of the concepts of distance, displacement, speed and velocity. Distance is the total length of the path traveled from the house to the procession destination. Displacement is the position from the initial point to the final point while considering direction. Speed refers to how fast the group moves without considering direction (Masril et al., 2018). Velocity refers to how fast the procession moves while taking direction into account (e.g., from east to west).

Distance:

$$s_{tot} = s_1 + s_2 \quad (20)$$

Displacement:

$$\Delta x = x_{final} - x_{initial} \quad (21)$$

Speed:

$$v = \frac{s}{t} \quad (22)$$

Velocity:

$$\vec{v} = \frac{\Delta x}{t} \quad (23)$$

Uniform Linear Motion (GLB) is used as an approach to calculate the average speed, travel time, and distance covered during the procession from one point to another.

$$s = vt \quad (24)$$

The concept of uniformly accelerated motion (GLBB) can be observed in the procession group using the *praje* during the phase of starting to move (from rest to motion) and when approaching the destination, where it slows down and eventually stops.

When starting to move:

$$v_t = v_0 + at \quad (25)$$

$$s = v_0 t + \frac{1}{2}at \quad (26)$$

When the procession is about to reach the house or encounters uphill and downhill paths, the concept of uniformly accelerated motion (GLBB) is also observed, with decelerating motion or negative acceleration (a < 0).

Reconstruction of Physics Concepts Based on Ethnoscience

Based on the results of the analysis, the *besunat* procession tradition using the *praje* contains various physics concepts that can be reconstructed into modern scientific knowledge. Cultural activities such as carrying the *praje* walking and playing traditional musical instruments demonstrate the application of concepts of force, equilibrium, energy, momentum and sound waves. This reconstruction shows that the cultural practices of the Sasak community represent a form of indigenous science that aligns with modern physics concepts. The use of local culture as a learning resource also supports the implementation of SDG 4 (Quality Education), particularly in providing inclusive, relevant, and quality learning. The ethnoscience approach allows students to learn physics concepts through cultural experiences that are close to their daily lives, thereby increasing learning engagement, scientific literacy and appreciation of local culture in a sustainable way. Thus, this tradition has the potential to be used as a contextual learning resource in physics education. The integration of culture into learning not only enhances students' conceptual understanding but also contributes to the preservation of local culture and the development of ethnoscience-based learning innovation.

Conclusion

This study shows that the *besunat* procession tradition using the *praje* among the Sasak ethnic community contains various physics concepts, such as Newton's Laws and dynamic equilibrium in the procession, torque and center of mass in the stability of the *praje*, work and energy, impulse and momentum in the *gendang beleq*, sound wave concepts in the *gendang beleq* and kinematics of motion. These concepts naturally emerge within the community's cultural activities and represent a form of indigenous science. This ethnoscience-based reconstruction of physics concepts has the potential to be used as a contextual learning resource that can enhance students' understanding and connect science with real-life situations. In addition, the integration of culture into learning also plays a role in preserving the local wisdom of the Sasak community. Future studies are recommended to develop ethnoscience-based physics learning media and teaching materials derived from the Sasak *arak-arakan besunat* tradition using *praje* for implementation in classroom learning. Further research may also involve quantitative approaches to measure the effectiveness of contextual ethnoscience learning in improving students' conceptual understanding, scientific literacy and cultural awareness. In addition, deeper scientific analysis using experimental measurements and digital sensors is suggested to obtain more accurate data related to force distribution, motion dynamics, sound resonance and vibration frequencies in traditional musical instruments such as *gendang beleq*. Comparative studies involving other local cultural traditions are also recommended to broaden the integration of indigenous knowledge into physics education and support sustainable culturally responsive learning aligned with SDG 4 Quality Education.

Acknowledgments

The authors would like to express sincere gratitude to the Sasak community members, traditional leaders and praje craftsmen in East Lombok for their participation and valuable contributions to this research. Appreciation is also extended to the lecturers and editors who provided constructive suggestions for improving this article.

Author Contributor

Conceptualization, R.A. and N.K.A.; methodology, writing—review and editing, R.A., S.N.S.N., and N.K.A.; formal analysis, supervision, R.A., S., and G.H.; investigation, resources, R.A., S.N.S.N., N.K.A., S., and G.H.; writing—original draft preparation, project administration, R.A.; visualization, S., N.K.A., and G.H. All authors have read and approved the published version of the manuscript.

Funding

This research received no external funding.

Conflicts of Interest

All author declares that there is no conflict of interest.

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