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Ethnoscience: Mapping the Potential of Sasak Local Wisdom as a Source of Science Learning

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Abstract

The integration of Sasak local wisdom into science education, particularly in biology, physics, and chemistry, offers a contextual and meaningful learning experience for students. This study explores the potential of Sasak cultural practices such as *Belaq Tangkel*, *Poteng Rekat*, *Bau Nyale*, and *Nyesek* to enrich science education. These traditions are linked to scientific concepts, including human reproduction, biodiversity, material physics, and chemical bonding. The research adopts a literature review approach to identify and map the educational potential of Sasak traditions, focusing on their relevance to scientific learning. For instance, *Belaq Tangkel* introduces students to embryonic development, while *Kalender Rowot Sasak* supports teaching astronomy. The integration of these practices promotes sustainability values, analytical skills, and cultural appreciation among students. Challenges such as limited resources and teacher training highlight the need for collaboration between educators, local communities, and researchers. This approach not only fosters cultural preservation but also enhances students' scientific understanding, providing a holistic and sustainable educational framework. The findings underline the importance of ethnoscience in bridging traditional knowledge and modern science to create an inclusive and culturally responsive education system.

Keywords: Sasak local wisdom, Ethnoscience, Contextual Learning, Sustainable Education, Science Integration

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INTRODUCTION

Ethnoscience is an educational approach that combines local knowledge systems with scientific concepts, offering a contextualized learning experience. Through ethnoscience, cultural practices and indigenous wisdom serve as mediums to explain scientific principles, making learning more relevant to students' everyday lives. This approach not only enhances students' understanding of science but also improves critical thinking skills and fosters a deeper appreciation of cultural heritage and environmental diversity (Hasibuan, 2023; Supiyati, 2024; Zelviana, 2023). However, despite its potential, research focusing on how Sasak community wisdom can be systematically integrated into science education remains scarce, highlighting an important gap addressed by this study.

The Sasak community of Lombok possesses a rich repository of local wisdom, as reflected in various cultural practices. For instance, the Belaq Tangkel tradition demonstrates ecological management through environment-based rituals, while the architecture of Sasak traditional houses (Bale Adat Sasak) employs local materials and principles of environmental adaptation, aligning with modern physics concepts (Sari, 2024; Wardani, 2023). Furthermore, Sasak traditional knowledge of local medicinal plants reveals significant links to ethnobotany, showcasing a deep understanding of nature's resources (H. Hunaepi et al., 2020; Mashami et al., 2023; Rahayu, 2023). These practices, although culturally significant, also hold immense scientific value, particularly for enriching science education.

The ethnoscience approach plays a pivotal role in bridging traditional knowledge with modern scientific frameworks. Integrating local wisdom into science curricula enables students to contextualize abstract concepts within their cultural realities, creating a more engaging and meaningful learning environment (Y. Astuti et al., 2023; H. Hunaepi et al., 2017, 2019; Idul, 2023). For example, the Belaq Tangkel ritual embodies environmental conservation principles, which can be incorporated into ecosystem studies and material cycles (Nirmala, 2024; Wardani, 2023). Similarly, the architectural design

of Bale Adat Sasak offers practical examples to explain physics principles, such as air circulation, material durability, and energy efficiency (Fuadi, 2024; Nimah, 2023)

Beyond scientific comprehension, integrating local wisdom in education promotes cultural preservation. When traditional practices are embedded within learning experiences, students not only grasp scientific concepts but also develop an appreciation for the values inherent in their cultural heritage (N. K. Hunaepi & Firdaus, 2016; Mashami et al., 2023; Wahyudi, 2023). For instance, the traditional Gendang Beleq art form, which encompasses mathematical patterns, connects students to their cultural roots while simultaneously enhancing their understanding of mathematics and science (Alditia, 2023; Rahayu, 2023).

Nevertheless, much of the existing research has focused on local wisdom from regions such as Java or Bali, leaving the Sasak community underrepresented in ethnoscience studies (Muliadi et al., 2022; Suanda, 2023). Often, Sasak traditions are viewed through aesthetic or spiritual lenses without exploring their scientific relevance comprehensively. Additionally, the approaches adopted in these studies tend to be anecdotal and lack systematic methodologies for identifying and mapping Sasak local wisdom that is relevant to science education (Nisa', 2024; Supiyati, 2024).

This study seeks to address these gaps by identifying and mapping Sasak local wisdom that is applicable to science education. A literature review methodology has been employed to analyze existing studies on Sasak cultural practices and their educational relevance. This includes examining the documented elements of Sasak traditions, such as the Ngejot ritual, medicinal plant usage, and the art of Gendang Beleq, to link them with scientific concepts within science curricula (Nuraeni, 2024; Suanda, 2023). This approach allows for a comprehensive mapping of Sasak local wisdom's scientific potential without necessitating extensive primary data collection.

By mapping the scientific components within Sasak local wisdom, this research contributes to the development of culturally responsive teaching materials. These modules aim to provide inclusive and contextually relevant learning experiences, ultimately improving student engagement and comprehension in science (Fatmawaty, 2024; Yuliana, 2023). Furthermore, this approach ensures the preservation of Sasak traditions by maintaining their relevance in contemporary education settings.

The primary contribution of this research lies in its interdisciplinary framework, which bridges cultural anthropology and science education. By integrating literary and scientific analyses, the study enriches the ethnoscience discourse and provides practical models for implementing education based on local wisdom. This framework can also be adapted to other Indonesian communities, rich in cultural heritage yet underexplored in educational contexts (Mudiartana et al., 2021; Rofiqoh, 2024).

Ultimately, this research not only identifies the educational potential of Sasak local wisdom but also positions it as a tool for cultural preservation and the advancement of relevant, sustainable education. By linking Sasak traditions with modern scientific principles, the study offers a holistic, contextualized learning approach that honors local cultural heritage while fostering global scientific literacy. The findings are expected to contribute significantly to developing a generation of students who are scientifically literate, culturally aware, and proud of their heritage (Gunawan, 2024; Ramdani et al., 2021).

METHOD

This research adopted a qualitative exploratory approach using a literature review methodology to systematically map the potential of Sasak local wisdom for science education. The primary objective was to identify ethnoscientific elements embedded in Sasak traditions and evaluate their applicability within science curricula. The research process was meticulously designed to ensure rigor and reliability, adhering to established guidelines for ethnoscience-based literature studies.

Data Collection

Data were collected from a wide range of academic sources, including journal articles, books, conference proceedings, and research reports. These sources were accessed through digital platforms such as Google Scholar, ResearchGate, and institutional repositories. Keywords such as "Sasak local

wisdom," "ethnoscience," "science education," "Sasak traditions," and "indigenous knowledge systems" were used to locate relevant literature. Inclusion criteria were:

1. Relevance to Sasak local wisdom and its scientific significance.
2. Direct connection to educational practices or scientific concepts.
3. Publications within the last ten years to ensure up-to-date findings, except for foundational texts essential for context.

Selection and Analysis

The selected literature was screened for quality and relevance, prioritizing peer-reviewed articles and credible academic sources. Content analysis was conducted to extract critical information on Sasak traditions, their underlying scientific principles, and their potential integration into biology, chemistry, and physics education. The analysis focused on identifying patterns, categorizing traditions by scientific disciplines, and linking traditional knowledge to contemporary scientific concepts.

Examples include:

1. The Belaq Tangkel ritual, analyzed for its ecological and biological insights into human reproduction and embryology.
2. The use of Bale Adat Sasak architecture to illustrate physics concepts such as air circulation and structural durability.
3. Traditional fermentation practices, such as Poteng Rekat, studied for their microbiological and biotechnological relevance.

Ethnoscientific Framework

An ethnoscientific framework was developed to map Sasak traditions across three key dimensions:

1. Ontology: Understanding the existence and meaning of Sasak traditions within cultural and scientific contexts.
2. Epistemology: Exploring the knowledge systems underlying these traditions and their scientific principles.
3. Axiology: Evaluating the values and practical applications of Sasak wisdom in sustainable education.

Integration into Science Education

The identified Sasak traditions were categorized into three scientific disciplines biology, chemistry, and physics and mapped to relevant science curricula. For instance:

1. Biology: Exploring marine biodiversity and life cycles through the Bau Nyale tradition.
2. Chemistry: Understanding chemical bonding through natural dye processes in traditional Sasak weaving.
3. Physics: Investigating heat transfer and thermoregulation through the Pedak Api tradition.

Validation

To ensure validity, findings were cross-referenced with existing ethnoscience studies from other regions in Indonesia. Comparative analyses were conducted to identify the unique characteristics of Sasak traditions and their broader relevance to science education. Collaborations with educators and cultural studies experts further validated the interpretations of the data.

Challenges and Limitations

Challenges included limited documentation of certain Sasak traditions and the anecdotal nature of some sources. To address these issues, supplementary materials from cultural archives and interviews with local educators and community leaders were incorporated when available.

Expected Outcomes

This study aims to deliver:

1. A comprehensive list of Sasak traditions with scientifically mapped relevance.

2. Recommendations for integrating these traditions into teaching modules tailored for biology, chemistry, and physics education.
3. An ethnoscience-based educational framework promoting sustainability, cultural preservation, and critical thinking among students.

RESULTS AND DISCUSSION

This study utilized a library research approach with an exploratory qualitative method to map the potential of Sasak local wisdom as a resource for science education. The research aimed to identify and analyze the ethnoscientific values embedded in Sasak local wisdom and explore its application in science education from the perspectives of ontology, epistemology, and axiology. Data sources were drawn from journal articles, books, seminar proceedings, and relevant research reports accessed via the Google Scholar platform. Literature was selected based on its relevance to the themes of Sasak local wisdom, ethnoscience, and science education.

The research process involved several steps. First, literature was collected by conducting searches using keywords such as "Sasak local wisdom," "ethnoscience," and "science education" on Google Scholar. Relevant literature was filtered and analyzed for its connection to the research topic. Content analysis was then performed to explore the scientific values within Sasak local wisdom, such as traditional practices in environmental management, agricultural techniques, and traditional calendrical systems. These potentials were then categorized into branches of science biology, chemistry, and physics and elaborated on how these concepts could be integrated into science education.

Synthesized Results

The findings of the study are presented in three categories: biology, chemistry, and physics. Table 1 summarizes the synthesis of Sasak local wisdom in biology-related science education.

A. Synthesis results of Sasak Local Wisdom in Biology Learning

This study demonstrates the rich potential of Sasak local wisdom to be integrated into science education, offering culturally contextual and meaningful learning experiences. The findings highlight diverse practices, such as the *Belaq Tangkel* ritual, agricultural traditions like *Ngaro/Nenggala* and *Gogo Rancah*, as well as cultural symbols like songket motifs, as sources for teaching scientific concepts. These traditions embody values and knowledge in biology, chemistry, and physics, covering topics like biodiversity, ecosystem dynamics, microbiology, and sustainable agriculture.

The integration of local wisdom into science education fosters a deeper understanding of scientific concepts while enhancing students' appreciation for cultural heritage. Learning activities such as group discussions, experiments, and project-based learning effectively connect traditional knowledge with modern scientific principles. This approach not only supports cultural preservation but also equips students with critical thinking and problem-solving skills. It emphasizes the importance of interdisciplinary strategies for sustainable and inclusive education.

Table 1. Synthesis of Sasak Local Wisdom in Biology Learning

No	Author/Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Science/Biology Learning	Integration in Learning Activities	Learning Outcome
1	(Mukti et al., 2022)	*Belaq Tangkel* ritual: flower bathing and use of coconut, eggs, and mantras.	Fertilization, embryo development, and human reproduction.	Helps students understand the connection between local traditions and human reproduction.	Group discussion on rituals and stages of embryo development.	Students understand human reproduction scientifically through an ethnoscience approach.

No	Author/Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Science/Biology Learning	Integration in Learning Activities	Learning Outcome
2	(Muchsin et al., 2023)	*Kemaleq*: Forest entry prohibition in Sade Village for environmental preservation.	Biodiversity and ecosystem.	Instills the importance of forest conservation for ecosystem balance.	Discussion on the impact of rule violations on ecosystems.	Students understand biodiversity based on local culture.
		Ngaro/Nenggala: Traditional plowing using animal power to maintain soil fertility.	Interaction of biotic and abiotic components in ecosystems.	Explains the relationship between biotic and abiotic components in traditional rice ecosystems.	Experiment analyzing soil composition after traditional plowing.	Students understand the impact of traditional methods on ecosystems and soil fertility.
		Poteng Rekat: Fermentation of glutinous rice using *katuk* leaves for traditional food.	Microbiology and biotechnology.	Understands fermentation processes and the use of microorganisms in food production.	Simple fermentation experiment with variations in local ingredients.	Students understand microbiological applications in local food production and potential biotechnology innovations.
3	(Dewi et al., 2023)	*Bau Nyale*: Catching marine worms believed to bring prosperity.	Marine biodiversity, ecology, and life cycles of marine organisms.	Connects local traditions with the concept of marine biodiversity.	Project observing the life cycle of *Nyale*.	Students understand marine ecosystems based on local wisdom.
4	(Lestary, 2024)	*Bebubus* ritual: Non-medical treatments using natural ingredients like turmeric and rice.	Chemistry of natural ingredients and anti-inflammatory benefits of turmeric.	Helps students understand the benefits of natural ingredients for health.	Experiment testing the anti-inflammatory properties of turmeric.	Students understand the health benefits of natural ingredients in local contexts.
5	(Dewi et al., 2021)	Local *awiq-awiq* system in Mount Rinjani for forest conservation.	Ecology, biodiversity conservation.	Enhances students' understanding of local wisdom-based conservation importance.	Discussion on ecosystem interactions based on local values.	Students understand ecosystem and conservation concepts based on local wisdom.
6	(Kohar & Taufikurrahman, 2020)	Sasak agricultural tradition: Crop rotation based on local knowledge.	Carbon cycle and soil resource management.	Links agricultural traditions to biogeochemical cycles.	Project simulating crop rotation based on natural cycles.	Students understand biogeochemical cycles and sustainable resource management.

No	Author/Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Science/Biology Learning	Integration in Learning Activities	Learning Outcome
7	(H. Hunaepi et al., 2019)	*Gogo Rancah*: Dryland farming system using minimal water, producing drought-resistant rice.	Interaction of biotic and abiotic components.	Helps students understand plant adaptation to environmental conditions.	Discussion on plant adaptation and project simulating the *Gogo Rancah* farming system.	Students understand plant adaptations and resource efficiency in sustainable farming systems.
8	(Muliadi et al., 2022)	Sasak songket motifs: Wayang, Subahnale, Keker, Bintang Empat, and Alang/Lumbung.	Classification of living organisms, reproduction systems, and solar system analysis.	Helps students understand the connection between science and local culture through songket symbols.	Group discussion on the meaning of songket motifs and project linking motifs with scientific concepts.	Students understand science concepts based on local culture and connect cultural heritage with scientific phenomena.

The integration of Sasak local wisdom into biology science education has shown significant potential in creating contextual and relevant learning experiences. Based on the synthesis presented in Table 1, various Sasak traditions and cultural practices, such as *Belaq Tangkel*, *Kemaleq*, and *Poteng Rekat*, effectively bridge scientific concepts with local knowledge, resulting in meaningful learning opportunities.

One notable example is the *Belaq Tangkel* ritual (Mukti et al., 2022), which illustrates the process of fertilization and human embryo development. Group discussions about this ritual help students understand the connection between local traditions and human reproduction science. This approach not only enriches students' scientific knowledge but also strengthens their appreciation of local culture.

The *Kemaleq* tradition (Muchsin et al., 2023), which prohibits entering forests in Sade Village, offers deep insights into biodiversity and ecosystem conservation. Learning activities, such as discussions on the impact of breaking these rules on ecosystem balance, raise students' awareness of the importance of culturally rooted environmental conservation.

Poteng Rekat, a traditional fermentation practice, serves as a medium for teaching microbiology and biotechnology (Muchsin et al., 2023). Simple fermentation experiments using local ingredients introduce students to scientific processes while opening opportunities for biotechnology innovations based on local resources. Learning outcomes indicate that students grasp the application of microbiology in local food production and identify potential areas for further development.

The integration of the *Bau Nyale* tradition into science education also stands out as a compelling example (Dewi et al., 2023). Observing the life cycle of *Nyale* as part of a project not only introduces students to marine biodiversity but also links local legends with marine ecology concepts. Emphasizing sustainability and marine conservation fosters students' appreciation of natural wealth and the importance of preserving marine ecosystems.

The *Bebubus* ritual (Lestary, 2024), which utilizes natural ingredients like turmeric and rice, demonstrates significant potential in teaching the chemistry of natural substances. Experiments testing the anti-inflammatory properties of turmeric help students understand the benefits of natural ingredients and their applications in local health contexts. This approach effectively uses local traditions to explain complex scientific concepts.

A sustainability-centered approach is also evident in traditional farming systems like *Gogo Rancah* (H. Hunaepi et al., 2019), which adapts to challenging environmental conditions. Discussions on plant adaptation and simulation projects based on *Gogo Rancah* farming systems provide insights into

resource efficiency and sustainable agriculture. Learning outcomes show that students understand plant adaptation concepts and the importance of sustainable resource management.

The *awiq-awiq* system in Mount Rinjani (Dewi et al., 2021) underscores the importance of biodiversity conservation through local values. Interactive discussions based on *awiq-awiq* values enhance students' understanding of ecology and the need to preserve ecosystems. This approach demonstrates how local wisdom can contribute to effective environmental education.

Despite its numerous benefits, the implementation of local wisdom in science education faces challenges. A major issue is the lack of supporting resources, such as relevant teaching modules and teacher training (Astuti et al., 2022). Addressing this requires collaboration among educators, local communities, and academics to develop teaching materials that align with curriculum needs and students' characteristics.

Nevertheless, this approach offers significant opportunities. Ethnoscience promotes interdisciplinary learning that integrates science, culture, and technology (Hasibuan, 2023; Supiyati, 2024). Through exploring traditions like Sasak songket motifs (Agus Muliadi et al., 2023), students can connect scientific concepts with cultural elements, creating a holistic learning experience.

The integration of local wisdom into biology science education significantly enhances students' scientific understanding while promoting cultural preservation. Through the ethnoscience approach, students learn science while appreciating sustainability and the harmonious relationship between humans and the environment. Therefore, continuous efforts are needed to develop relevant teaching materials, train educators, and encourage cross-sector collaboration to maximize the potential of local wisdom in education.

B. Synthesis results of Sasak Local Wisdom in Physics Learning

The synthesis of Sasak local wisdom in physics education reveals its significant potential to enrich learning by bridging scientific concepts with cultural practices. Traditions like the *Rowot Sasak* calendar, *Ngarem*, and *Saling Bemeriq* provide opportunities to explore astronomy topics such as star cycles, celestial motion, and Earth's precession. These cultural practices not only help students understand fundamental astronomy concepts but also connect them to their heritage, fostering a holistic learning experience.

Similarly, practices like the orientation of traditional houses and the *Bale Tani* design introduce students to principles of physics, including solar motion, material elasticity, and earthquake-resistant structures. These examples demonstrate the applicability of local wisdom to real-world problems and sustainable design. The *Pedak Api* tradition further illustrates the concept of heat transfer and body thermoregulation, linking cultural practices to modern physics. This integration enriches students' understanding, promotes cultural preservation, and demonstrates the relevance of local wisdom in solving scientific and practical challenges.

Table 2. Synthesis of Sasak Local Wisdom in Physics Learning

No	Author/Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Physics Education	Integration in Learning Activities	Learning Outcome
1	(Kohar & Taufikurrahman, 2020)	*Rowot Sasak Calendar*: New Year marker based on Pleiades constellation.	Declination, star orientation, star cycles.	Understanding the connection between traditional astronomy and modern scientific concepts.	Discussion on the *Rowot Sasak* calendar method and astronomy software simulation.	Students understand basic astronomy concepts and their connection to local traditions.

No	Author/Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Physics Education	Integration in Learning Activities	Learning Outcome
		Ngarem (Tilem): Period when *Rowot* stars disappear and reappear, marking the New Year.	Orbital periods, synodic cycles, and celestial motion related to calendars.	Explaining celestial motion phenomena underlying Sasak traditional calendrical systems.	Astronomy data analysis project using software simulation to determine *Ngarem* timing and *Rowot* star reappearance .	Students understand celestial motion dynamics and apply concepts to time calculation and astronomical events.
		Saling Bemeriq: Belief that *Rowot* and *Tenggale* stars "dislike each other" due to never appearing together.	Star elongation, precession effects, ecliptic orbit.	Relating local beliefs to modern scientific concepts, such as changes in star positions due to Earth's precession.	Discussion on cultural beliefs and scientific facts, and a star movement simulation project using digital planetariums.	Students understand traditional beliefs' connection to astronomical events and explain celestial motion patterns using scientific data.
2	(Arizona et al., 2023)	House orientation facing east or west to facilitate *qibla* direction determination.	Astronomy: Sun's motion.	Linking traditional house orientation with celestial motion.	Observing house orientation based on the sun's position.	Students understand the relationship between celestial motion and traditional building orientation.
		Bale Tani: Traditional houses made of natural materials for earthquake mitigation.	Material physics: bamboo elasticity and load distribution.	Understanding earthquake-resistant design principles based on local knowledge.	Miniature *Bale Tani* model project to test material elasticity.	Students understand earthquake-resistant design principles based on local traditions.
3	(Arifin et al., 2024)	*Pedak Api*: Using a fireplace for newborns.	Heat transfer and body thermoregulation.	Helping students understand heat transfer and body temperature regulation.	Discussion on heat transfer mechanisms and simulation experiments on radiation processes.	Students understand heat transfer and its relationship to local traditions.

The integration of Sasak local wisdom into physics education offers opportunities to create contextual, relevant, and meaningful learning experiences. This approach enables students to understand scientific concepts through a cultural lens, bridging scientific theory with traditional practices embedded in Sasak daily life. One of the traditions integrated is the *Rowot Sasak* calendar, which uses the Pleiades constellation as a New Year marker. This tradition is closely related to concepts of declination, star orientation, and star cycles (Kohar & Taufikurrahman, 2020). Learning activities involving astronomy software simulations help students deeply understand the movements of the *Rowot* stars,

connecting traditional phenomena like *Ngarem* (the period when the stars disappear) with synodic cycles and celestial dynamics.

Local beliefs, such as *Saling Bemeriq*, which describes the idea that the *Rowot* and *Tenggale* stars never appear together, provide unique opportunities to explore star elongation, precession effects, and ecliptic orbits. Classroom discussions link celestial motion patterns with traditional beliefs, using digital planetarium simulations to identify Earth's precession phenomena underlying star position shifts. This approach enhances students' understanding of astronomy while appreciating how local traditions document natural phenomena.

Sasak wisdom is also evident in the traditional orientation of houses facing east or west, simplifying *qibla* direction determination. This tradition is relevant to teaching solar motion and celestial orientation concepts (Arizona et al., 2023). Observing the sun's position and house orientation allows students to learn astronomy basics directly, creating a learning experience rooted in their daily lives. Additionally, the design of *Bale Tani*, earthquake-resistant traditional houses made of natural materials, provides an opportunity to study material physics, especially bamboo elasticity and load distribution. Miniature *Bale Tani* model projects enable students to test material elasticity and understand earthquake-resistant design principles relevant to disaster mitigation.

The *Pedak Api* tradition, which involves using a fireplace to regulate a newborn's body temperature, serves as a medium for learning about heat transfer and thermoregulation (Arifin et al., 2024). Experiments on heat transfer mechanisms conduction, convection, and radiation help students understand how this tradition employs scientific concepts for practical needs. This approach links local phenomena with modern physics principles, broadening students' perspectives on the application of science in cultural contexts.

Integrating Sasak local wisdom into physics education also offers long-term benefits for students. For example, by studying the *Rowot Sasak* calendar, students analyze astronomical data and simulate celestial motion using digital tools. Such activities not only enhance their analytical skills but also strengthen the relevance of learning to real life. Tradition-based projects, such as building *Bale Tani* models or simulating heat transfer in *Pedak Api*, highlight the importance of connecting modern science with local knowledge.

Despite the significant benefits, challenges remain, particularly the lack of supporting resources, such as tradition-based learning modules and teacher training (I. A. D. Astuti et al., 2022). Collaboration among educators, local communities, and scientists is essential to develop teaching materials aligned with curriculum needs. This approach supports cultural preservation while instilling values of sustainability and social responsibility in students.

The integration of local wisdom into physics education demonstrates tremendous potential for enhancing students' scientific understanding while promoting cultural preservation. Traditions like the *Rowot Sasak* calendar, house orientation, *Bale Tani*, and *Pedak Api* enrich students' learning experiences by linking scientific phenomena with their daily lives. By understanding the connection between science and culture, students gain not only scientific knowledge but also an appreciation for local wisdom in fostering a more sustainable and harmonious world. Strategic steps are necessary to develop relevant teaching materials, train educators, and encourage cross-sector collaboration to maximize the potential of ethnoscience in education.

C. Synthesis results of Sasak Local Wisdom in Chemistry Learning

The synthesis of Sasak local wisdom in chemistry learning, as presented in Table 3, highlights its potential to connect scientific concepts with cultural practices. Traditions such as *Merarik*, *Bebubus*, and *Nyesek* effectively bridge topics like chemical bonding, natural substance chemistry, and organic reactions with local traditions. Practices like cleaning floors with cow dung (*Sade Village*), producing biodiesel from *nyamplung* oil, and using metal alloys in traditional instruments illustrate real-world applications of chemistry concepts. This integration fosters a deeper understanding of science, cultural appreciation, and environmental sustainability, enriching students' learning experiences while promoting the relevance of local wisdom.

Table 3. Synthesis of Sasak Local Wisdom in Chemistry Learning

No	Author /Year	Local Wisdom/Traditional Science	Scientific Concept	Integration Potential in Chemistry Education	Integration in Learning Activities	Learning Outcome
1	(Wahyudiati & Fitriani, 2021)	*Merarik* tradition: Use of metals in traditional jewelry.	Chemical bonds and atomic structure.	Helps students understand chemical bonding concepts through analogies with local traditions.	Discussion on the relationship between traditions and electron transfer in ionic bonds.	Students understand chemical bonding concepts by connecting scientific theories with local culture.
2	(Lestary, 2024)	*Bebubus* ritual: Traditional medicine using natural materials like turmeric, rice, and holy water.	Chemistry of natural substances, anti-inflammatory properties, and human-environment interaction.	Enhances students' understanding of natural materials for health and their relationship to ecosystems.	Experiment on turmeric's anti-inflammatory properties and discussion on traditional practices in chemistry.	Students understand the benefits of natural materials for health and apply chemistry knowledge in local contexts.
3	(Arifin et al., 2024)	*Teken (bracelet)*: Traditional baby accessories made of turmeric, garlic, and *jeringau*.	Chemical and bioactive properties of medicinal plants, such as anti-inflammatory and antimicrobial effects.	Introduces students to the use of traditional medicinal plants for health and their cultural applications.	Practical test on the bioactivity of plants against microorganisms and discussion on local medicinal traditions.	Students understand the importance of local medicinal plants for health and their role in local wisdom.
4	(Mashami et al., 2023)	Floor cleaning with cow/buffalo dung in Sade Village to make floors sturdy, insect-repellent, and weather-resistant.	Organic and inorganic compounds, minerals, and chemical bonds in cow dung ash.	Explains chemical compounds like silicates and organic compounds in traditional house construction.	Group discussion on the function of minerals in cow dung and simple chemical analysis of dung ash.	Students understand the role of natural materials in traditional construction and their relationship to chemistry.

	Dilah Jojor: Making lamps from *nyamplung* seeds containing high vegetable oil.	Organic compounds, biodiesel production, and esterification/transesterification reactions.	Helps students understand biodiesel production from natural materials and its application in traditional lamps.	Experiment on biodiesel production from *nyamplung* oil using esterification and transesterification steps.	Students understand biodiesel as renewable energy from local natural materials.
	Nyesek: Coloring Sasak woven fabrics using natural dyes like mangosteen skin, *secang* wood, and mango leaves.	Organic and inorganic compounds and fixation processes using lime (Ca(OH)2) and alum (Al2(SO4)3).	Explains chemical reactions in natural fabric dyeing and fixation processes.	Discussion on chemical reactions in natural dyeing and project on dye production from local materials.	Students understand natural dyeing processes and their application in chemistry concepts.
	Gendang Beleq: Traditional Sasak musical instruments made of metals like bronze with high acoustic properties.	Chemistry of metals, metal alloys, and acoustic material properties.	Introduces students to the production and characteristics of metal alloys in traditional musical instruments.	Group discussion on the properties of metals in traditional instruments and simple simulation on acoustic properties.	Students understand the connection between metal properties and their use in traditional musical arts.

The integration of Sasak local wisdom into science/chemistry learning offers a great opportunity to create contextual and relevant education that resonates with students' daily lives. Traditions and cultural practices such as *merarik*, *bebubus*, and *teken*, along with the use of natural materials in fabric dyeing, serve as effective media to connect chemical theories with community traditions.

The *merarik* tradition, which involves the use of metals in traditional jewelry, can be used to teach concepts of chemical bonding and atomic structure (Wahyudiati & Fitriani, 2021). Discussions about electron transfer in ionic bonding can be connected with analogies from this local tradition, providing students with a concrete understanding of abstract chemistry concepts. This approach helps students grasp chemical theories through a local cultural perspective, thereby enhancing their engagement and comprehension.

The *bebubus* ritual, a non-medical healing practice using natural materials such as turmeric, rice, and holy water, is relevant for explaining the chemistry of natural materials, the anti-inflammatory benefits of turmeric, and human interactions with ecosystems (Lestary, 2024). Experiments testing the anti-inflammatory properties of turmeric provide students with hands-on experiences in applying chemical concepts to real-life situations. Discussions about the relationship between traditions and human health also enrich students' awareness of sustainability and the use of natural resources.

The *teken* tradition, which involves baby accessories made of turmeric, garlic, and jeringau, introduces students to the chemical and bioactive properties of medicinal plants (Arifin et al., 2024). Practical activities to test the bioactive properties of plants against microorganisms allow students to understand how local medicinal plants can be used to maintain health. Discussions focusing on the contribution of medicinal plants within local wisdom also help students appreciate the importance of traditions in the context of modern healthcare.

The practice of mopping floors with cow dung in Sade Village illustrates the use of organic and inorganic compounds, such as silicates, in traditional house construction (Mashami et al., 2023). Simple chemical analyses of the ash content in cow dung provide students with insights into the functions of natural materials in traditional construction. Group discussions on the role of minerals in cow dung further enrich students' understanding of the relevance of chemistry in daily life.

The *dilah jojor* tradition, involving the production of lamps from nyamplung seeds rich in vegetable oil, offers opportunities to teach concepts of biodiesel processing through esterification and transesterification reactions. Experiments on biodiesel production from nyamplung oil help students understand the process of renewable energy production from local natural materials. This approach not only introduces students to chemistry concepts but also to energy sustainability issues relevant to future needs.

The dyeing process of Sasak woven fabrics, known as the *nyesek* tradition, uses natural dyes such as mangosteen peel, sappanwood, and mango leaves. This process is relevant for explaining chemical reactions in fabric dyeing and fixation using materials like lime ($Ca(OH)_2$) and alum ($Al_2(SO_4)_3$). Through discussions on chemical reactions and projects involving the creation of dyes from local materials, students can understand chemical concepts in an applied manner while also appreciating local traditions.

Traditional Sasak musical instruments, such as *Gendang Beleq*, use metals like bronze, which have high acoustic properties. These metal alloys serve as a medium to teach the chemistry of metallic elements and the acoustic properties of materials. Group discussions on the properties of metals in traditional musical instruments and simple simulation projects to determine the acoustic properties of metals provide students with interactive learning experiences. This helps them understand the connection between the properties of metals and their applications in traditional musical arts.

The integration of Sasak local wisdom into science/chemistry learning not only enriches students' understanding of chemical concepts but also provides relevant learning experiences connected to their lives. This approach increases student engagement, strengthens analytical skills, and instills cultural preservation values. By linking science with local traditions, students can develop a holistic understanding that is not only scientific but also contextual and sustainable. Strategic steps such as developing tradition-based modules and training teachers are needed to maximize the potential of local wisdom in chemistry education.

The integration of Sasak local wisdom into science learning be it biology, physics, or chemistry has proven effective in creating contextual, relevant, and meaningful learning. In biology, traditions such as *Belaq Tangkel*, *Poteng Rekat*, and *Bau Nyale* connect concepts of human reproduction, microbiology, and marine ecology with local culture, helping students understand science through traditional phenomena close to their lives. This tradition-based approach strengthens students' understanding of sustainability and the importance of environmental preservation.

In physics, the *Rowot Sasak Calendar* tradition and the design of *Bale Tani* houses serve as media to teach astronomy and material physics. Software simulations and model-building projects allow students to understand the dynamics of celestial bodies and earthquake-resistant designs based on local knowledge, emphasizing the relevance of science in disaster mitigation and cultural preservation.

In chemistry, traditions such as *bebubus*, *nyesek*, and biodiesel production from nyamplung oil teach concepts of natural material chemistry, esterification reactions, and fabric dye fixation. Tradition-based experiments help students understand the application of chemistry in health, renewable energy, and art. The integration of Sasak local wisdom creates learning experiences that connect science with tradition, enhancing students' understanding, preserving culture, and instilling sustainability values.

CONCLUSION

The integration of Sasak local wisdom into science education, particularly in biology, physics, and chemistry, offers a significant opportunity to create contextual, relevant, and meaningful learning experiences. Traditions such as *Belaq Tangkel*, *Poteng Rekat*, *Bau Nyale*, *Nyesek*, and *Kalender Rowot Sasak* effectively bridge modern scientific concepts with traditional knowledge, enabling students to understand science through a local cultural lens. This approach enriches students' comprehension of scientific concepts, instills cultural preservation values, and promotes sustainability. Challenges,

including limited supporting resources and inadequate teacher training, highlight the need for collaborative efforts to maximize this potential. Overall, this integration provides a holistic learning experience, enhances students' analytical skills, and connects science to their daily lives**.**

RECOMMENDATIONS

To maximize the potential of integrating Sasak local wisdom into science education, several steps are recommended. First, the development of curriculum-aligned learning modules based on Sasak traditions is essential to provide structured resources for educators. Additionally, teacher training programs focusing on ethnoscience-based teaching methods should be conducted to enhance teachers' abilities to effectively incorporate local wisdom into their lessons. Collaboration among educators, local communities, and academics is crucial to explore and document local traditions, ensuring their relevance to modern science education. Furthermore, implementing project-based learning that involves direct exploration of Sasak traditions can provide students with experiential learning opportunities, making science education more engaging and meaningful. Continued research is needed to identify additional traditions that can support science education, particularly in the areas of technology and innovation. Finally, campaigns to promote cultural preservation should be integrated into education, raising awareness among students and the community about the importance of safeguarding local wisdom as part of sustainable development and global education. These efforts collectively aim to create a holistic and culturally responsive learning environment.

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