



Identification Of Ethnoscience Studies in Science Learning to Strengthen Cultural Relevance in Primary Education

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Abstract. To create contextual and culturally responsive science learning, integrating local knowledge into the curriculum has become increasingly important in ethnoscience. This study aims to analyze ethnoscience studies in science learning in grade IV elementary school and identify ethnoscience aspects contained in the learning material. The research method used is a qualitative description, where the researcher acts as the main instrument by using additional instruments in the form of library study guides and documentation. Data collection techniques were carried out through *library research* with a qualitative data analysis approach which includes three stages: data reduction, data presentation, and conclusion drawing. To test the validity of the data, a triangulation technique of reference sources that have a correlation with the topic under study was used, such as journals, articles, books, and other documents. The results of this study show that ethnoscience studies have been integrated in science learning in grade IV elementary schools, especially in certain themes. In theme 1, for example, ethnoscience studies are related to sound material and associated with cultural values through the introduction of traditional musical instruments, such as angklung, saluang, harp, drum, and tifa. Meanwhile, in theme 7 and theme 8, which discuss style and movement, cultural values are integrated through learning traditional dance movements, such as plate dance, candle dance, and padupa dance. These findings highlight the potential of ethnoscience to enrich science education by connecting scientific concepts with local cultural practices, fostering a deeper understanding of both the natural world and cultural heritage.

Keywords: Elementary School; Ethnoscience; Science Learning

Introduction

Science learning in elementary schools often centers on theoretical concepts and is not related to everyday life. As a result, it is difficult for students to understand and relate the material learned to real experiences that occur in their environment. As a result, students' interest in learning science decreases. The 2015 PISA (*Program for International Students Assessment*) study showed that the science literacy of students in Indonesia was ranked 62 out of 70 countries surveyed. Similarly, the results of the score achievement in the 2018 survey, Indonesian children's science literacy only reached a score of 396 from the average world score which has reached 500 (OECD,

2019). According to Firman Abidin, (2015) science literacy is low, because students have not been able to associate science knowledge learned with phenomena that occur around them and do not gain experience to relate.

At the same time, in the context of education in Indonesia, there is a wealth of culture and local wisdom that can be integrated in the teaching and learning process. Education oriented to the cultural context is known as ethnoscience which has the potential to make learning more meaningful for students. This is in line with the opinion of Sudarmin (2015) in (Silla et al., 2023) that ethnoscience is one of the scientific approaches used in education in Indonesia today, namely indigenous knowledge in

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language, cultural customs, and morals, as well as technology made by communities or individuals using scientific knowledge. As stated by Wahyu (2017), the approach focuses on the use of ethnoscience learning strategies and planning that integrates culture in the science learning process. Ethnoscience will be more easily identified through the educational process about daily life developed by culture such as fairy tales, songs, games, traditional houses, traditional rituals, local production, utilization of nature is a form of ethnoscience education system (Nuralita, 2020). This approach teaches teachers to combine indigenous knowledge with scientific knowledge. Through this method, students are expected to understand science concepts more effectively and with deeper meaning because the material is connected to their own cultural environment.

The application of ethnoscience in science learning in primary schools is still not optimal. Teachers in primary schools often do not fully utilize this approach because they have limited knowledge about ethnoscience and do not have teaching materials that support the integration of ethnoscience in science subjects. Whereas a teacher is required not only to provide knowledge, foster attitudes and train skills, but more than that. This meaningfulness can only be achieved if educators are able to connect with students' experiences, social life, the real environment, even in the realm of local art and culture (Alfiana & Fathoni, 2022). In fact, nowadays the formal education process tends to be seen as a learning process that is separate from the acculturation process and separate from the cultural context of society (Wahyu, 2017). Therefore, many people consider school subjects to be higher (*social prestige*), than cultural traditions that are seen as meaningless and low (*discreditation*). The study of natural sciences in general is still centered on book material (Sunarti, 2019).

In research Amini et al., (2021) shows that the use of an ethnoscience-based problem-based learning model on colloidal material is effective in the development of colloidal materials. improve students' critical thinking skills compared to using conventional models. In addition, research conducted by (Alviya et al., 2023) showed that learning that utilizes local wisdom as a learning resource can increase students' scientific knowledge and local knowledge. this is inline with research conducted by Lasmana, (2024) that the ethnoscience model is an effective tool for exploring local wisdom through project-based learning, where in the ethnoscience model can help students understand scientific concepts, increase curiosity and interest in science, appreciate local wisdom, and understand scientific concepts, increase curiosity and interest in science, appreciate local wisdom, and develop 21st

century skills. A number of these studies show that the application of ethnoscience can improve students' understanding of science concepts and make scientific knowledge more related to everyday life. Some studies also show that ethnoscience helps students appreciate their local culture more and foster their love for science.

Based on the results of interviews conducted with fourth grade teachers at SD Negeri 32 Lagaligo, it was found that teachers did not know what ethnoscience was so that the application of ethnoscience in learning had not been carried out, especially in science subjects. This gap underlines the urgency of exploring how ethnoscience can support the improvement of students' understanding of science concepts in ways that are contextual and meaningful. Therefore, this research focuses on identifying and analyzing local cultural heritage that has the potential to be integrated into Grade IV science learning materials. The goal is to support the development of science learning that not only improves academic outcomes but also instills awareness and appreciation of local culture. The dependent variable emphasized in this study is students' understanding of science concepts, particularly how it can be improved through the ethnoscience approach. This research is expected to contribute to the development of contextual and culturally relevant instructional models that can be implemented across elementary schools in Indonesia.

The material presented by the teacher has not been integrated with culture, so it does not utilize local wisdom as a learning resource. Therefore, through the ethnoscience approach, students are expected to be able to master natural science without leaving their cultural values. Thus, students can be more concerned about the social and cultural environment and instill local culture-based character (Syazali & Umar, 2022).

Based on the explanation above, the research is interested in conducting further and in-depth research on local cultural heritage that has the potential to be associated with concepts in science materials in grade IV elementary school. The purpose of this research is to identify and study the potential of local cultural heritage that can be integrated into science learning in grade IV elementary school. Thus, ethnoscience learning can be implemented effectively, so as to improve students' understanding of natural science and foster awareness of the importance of maintaining and appreciating local culture. This research is expected to contribute in developing contextual and culture-based learning methods, which can be applied in various other elementary schools.

Method

This type of research is descriptive qualitative research that aims to describe existing phenomena in depth and detail (Adji, T.P., 2024). This research was conducted at SD Negeri 32 Lagaligo, with the researcher as the main instrument. The researcher himself is responsible for collecting data from various sources by searching and collecting the necessary data by researching and reviewing literature books, while the instruments used by researchers to obtain in-depth and accurate information in this study are using library study guides, documentation and interviews.

The data analysis technique used in this research is based on *Miles and Huberman's* qualitative data analysis which consists of three stages, namely: data reduction, data presentation, and conclusion drawing/verification. In the data reduction stage, the researcher summarizes the data and information that has been obtained from the results of literature studies, documentation and interviews. The results of the data

reduction are then arranged systematically so that they are easy to understand. Furthermore, at the data presentation stage, researchers try to classify and present data from the data reduction process through source triangulation, namely the process of finding the truth of certain information through various sources such as books, journals, articles and other writings as data that have a correlation relationship with the themes and problems studied. The final stage is the stage of drawing conclusions based on the results of the data presentation that has been done (Sugiyono, 2019).

Result and Discussion

Result

Based on the results of research on the identification of ethnoscience studies in science learning in grade IV elementary schools carried out through observation and literature study is described as follows:

Table 1. Traditional Musical Instruments

| Musical Instrument | Region of Origin | Function | Integration into Learning Materials |
|----------------------|----------------------------|------------------------------------|---|
| Saluang | Minangkabau, West Sumatra | Melodic | Circular breathing technique; introduction to traditional wind instruments |
| Kecapi/Kabosi | South & Southeast Sulawesi | Melodic & song accompaniment | Scale and harmony practice; cultural migration and Bugis maritime heritage |
| Kendang (Drum) | West Java | Rhythmic & tempo controller | Traditional rhythm and tempo training; synchronization in ensemble |
| Tifa | Papua & Maluku | Rhythmic & ritual accompaniment | Ritual rhythms; musical expression; Eastern Indonesia's cultural and spiritual values |
| Angklung | West Java | Melodic & educational (collective) | Ensemble playing, cooperation, pitch coordination; interactive and collaborative music learning |
| Zither (Harp/Kecapi) | South & Southeast Sulawesi | Melodic & dance/song accompaniment | Melodic variation and plucking technique; use in dance and traditional entertainment |

The *saluang* is a traditional bamboo flute from the Minangkabau culture of West Sumatra, Indonesia, and serves as a prime example of how traditional wind instruments incorporate advanced breathing techniques. Classified as an aerophone, the *saluang* is crafted from thin bamboo and is renowned for the use of circular breathing a method that allows players to inhale through the nose while simultaneously expelling air through the mouth, enabling continuous sound production without interruption. This technique, which requires significant practice and control, allows the performer to sustain melodies from start to finish without pausing to breathe. Historically, the *saluang* evolved from simpler instruments made of rice stalks with limited tone holes, gradually

developing into a more complex instrument capable of a broader melodic range. The sound it produces results from the vibration of air within the bamboo tube and falls within the human audible frequency range. The use of circular breathing in *saluang* performance reflects a wider tradition found among various indigenous wind instruments, where uninterrupted airflow is essential for both musical expression and cultural performance.

The *kecapi*, also known in some regions as *kabosi*, is a traditional stringed instrument widely used among the Bugis and Makassarese communities of South Sulawesi, Indonesia. This zither-like instrument plays a central role in traditional music, especially in scale and harmony practices within maritime oral traditions.

Tuned to pentatonic or heptatonic scales depending on the regional context, the *kecapi* serves both melodic and harmonic functions, often accompanying lyrical poetry (*sinrili*) or seafaring epics. Its musical structure reflects the adaptive nature of Bugis culture, shaped by centuries of cultural migration and interaction across island networks in the Indonesian archipelago. As skilled maritime navigators, the Bugis carried their musical practices—including *kecapi* performance across port cities and trade routes, leading to the instrument's integration into diverse cultural settings and the blending of musical scales. Today, the *kecapi/kabosi* not only represents an important aspect of Bugis maritime heritage, but also illustrates how traditional instruments evolve through intercultural contact, sustaining complex harmonic expressions rooted in seafaring identity and communal storytelling.

The *kendang* is a traditional double-headed drum that has long been integral to musical life in Java, with a wide variety of local names, forms, and functions. Typically made from wood—especially jackfruit wood due to its durability and acoustic quality—the *kendang* is designed to produce distinct tones: a deeper “dhang” from the larger membrane and higher-pitched “tak” and “thung” from the smaller side. As a central component of the gamelan ensemble, the *kendang* plays a key role in regulating tempo and rhythm, acting as a conductor-like guide for synchronization among instruments. Its playing technique, which involves striking with the palms and fingers in complex rhythmic patterns, is deeply tied to traditional rhythm training, often passed down through oral instruction and imitation. The use of the *kendang* fosters ensemble coordination and reinforces temporal awareness, making it essential not only for musical cohesion but also for developing discipline and attentiveness in group performance. Beyond its musical function, the *kendang* also holds philosophical significance in Javanese culture, symbolizing human responsiveness and spiritual alertness—qualities reflected in the precision and timing demanded by its performance in traditional ensembles.

The *tifa* is a traditional percussion instrument from Eastern Indonesia, particularly Papua and Maluku, and serves as a powerful symbol of cultural identity and spiritual heritage among local communities. Crafted from sturdy wood such as *lenggua* and often covered with animal skin, the *tifa* produces deep, resonant sounds that are essential to many ritual practices and communal gatherings. It is typically played by striking the membrane with the hands, and its unique tone falls within the audible frequency range, creating strong

rhythmic pulses that are both musical and ceremonial. The *tifa* is not only used to accompany traditional dances and songs, but also plays a central role in religious rites, tribal gatherings, and spiritual celebrations, where rhythm becomes a medium of expression and connection to ancestral values. Its repetitive, pulsating beats support ritual rhythms that guide movements and chants, helping synchronize collective actions and embodying the musical expression of Papuan cosmology. As a vessel of cultural and spiritual values, the *tifa* bridges the physical and metaphysical, allowing rhythm to function as both a musical and sacred language within the traditions of Eastern Indonesia.

Angklung is a traditional Indonesian musical instrument made of bamboo and classified as an idiophone, meaning its sound is produced from the vibration of its own body when shaken. Originally found in various parts of Indonesia such as Java and Bali, the modern form of angklung is widely recognized today for its use in both traditional and educational settings. Each angklung consists of two to four bamboo tubes of different lengths attached to a bamboo frame, each tuned to a specific pitch. When shaken, the tubes resonate to produce a single note. What makes angklung unique is its reliance on ensemble playing, where each player is responsible for one or a few specific tones. To create a full melody, players must collaborate in real time, listening and responding to one another with precise timing and pitch coordination. This interdependence fosters a high level of cooperation and musical sensitivity, making angklung performance an excellent example of interactive and collaborative music learning. The harmonies produced in an angklung ensemble emerge from the synchronization of individually simple tones, demonstrating how communal participation is essential to the instrument's musical richness. Additionally, angklung is often used in cultural ceremonies and traditional rituals, not only as a musical expression but also as a means of teaching respect, discipline, and unity within the group.

The harp, also known in Southeast Sulawesi as *kabosi*, is a traditional plucked string instrument widely recognized across South Sulawesi and beyond. Thought to have spread to other regions through historical maritime movement, the harp reflects the deep connection between music, mobility, and cultural transmission in Eastern Indonesia. Its shape and portability suggest an origin linked to sailors and traders, especially among the Bugis and Makassar communities, who have long been known for their seafaring expertise. Functioning primarily as an accompaniment instrument, the harp is played by plucking its strings to produce resonant tones within

the human audible range. The pitch and tone are determined by the length, thickness, and tension of the strings, as well as the player's technique. Traditionally, it is used to accompany folk songs and dances, making it central to various public and private events, including weddings, celebrations, and ceremonial gatherings. Beyond its musical role, the harp

fosters interactive participation, requiring players to develop pitch sensitivity, control, and coordination skills that are often passed down informally through oral tradition and collaborative learning. As a result, the harp not only sustains musical expression but also serves as a medium for preserving cultural narratives and communal identity.

Table 2. Traditional Dance

| Traditional Dance | Region | Values of Local Wisdom | Integration into Learning |
|------------------------------------|----------------|---|---|
| Plate Dance (<i>Tari Piring</i>) | West Sumatra | Gratitude, cooperation, hospitality | Cultural Arts, Civics, Indonesian Language, P5 |
| Candle Dance (<i>Tari Lilin</i>) | West Sumatra | Caution, precision, spiritual symbolism | Cultural Arts, Indonesian Language, Local Content |
| Bosara/Paduppa Dance | South Sulawesi | Respect, hospitality, appreciation for guests | Cultural Arts, Civics, P5, Local Content |

The *Plate Dance* is a traditional dance from West Sumatra that embodies values of gratitude, cooperation, and hospitality. In this dance, performers skillfully move while balancing plates in both hands, symbolizing unity and harmony in communal life. These values resonate with the kabosi tradition, where musical collaboration requires synchronization and mutual awareness, much like how dancers coordinate their movements in a group. In educational settings, *Tari Piring* can be integrated into subjects such as Cultural Arts, Civics, Indonesian Language, and P5 (Pancasila Student Profile) to reinforce teamwork, cultural appreciation, and social harmony. When performed with traditional music including the kabosi, this dance becomes a medium for interactive learning and the embodiment of local wisdom through arts.

The *Candle Dance* emphasizes caution, precision, and spiritual symbolism, as dancers perform intricate movements while holding lit candles in the dark. This requires strong focus and careful coordination, values that are also nurtured through learning to play the kabosi, which demands fine motor skills, emotional control, and sensitivity to sound and timing. As both the candle dance and kabosi performances require attention to detail and artistic expression, they provide meaningful opportunities for interactive and mindful learning. Integration of this dance into Cultural Arts, Indonesian Language, and Local Content subjects allows students to explore symbolic meaning, spiritual depth, and technical mastery, while also strengthening their appreciation for local heritage.

The *Bosara* or *Paduppa Dance* from South Sulawesi celebrates respect, hospitality, and appreciation for guests—core values in Bugis-Makassar society. This dance is typically performed to honor important guests during ceremonies and is often accompanied by traditional instruments such as the kabosi. In ensemble

performance, both dancers and musicians collaborate to create a welcoming atmosphere, reinforcing the importance of cooperation and mutual respect. In an educational context, this dance can be integrated into Cultural Arts, Civics, P5, and Local Content to teach students about social etiquette, collaborative learning, and the cultural role of music in strengthening community ties. Through participation in both dance and music, learners engage directly with the values of hospitality and togetherness that define Eastern Indonesian traditions.

Discussion

Ethnoscience is an educational strategy that integrates local culture into the learning process to create a harmonious interaction between scientific concepts and indigenous wisdom (Tanu, 2018). This approach applies science in the context of indigenous life, blending scientific understanding with cultural values to build students' character. The ethnoscience model has proven beneficial in helping students understand scientific material contextually, enhancing their interest in science, and fostering appreciation for local traditions as part of the learning experience (Lasmana O., 2024). As an ethnographic approach, ethnoscience seeks to understand how traditional communities develop and transmit knowledge about nature and their philosophy of life. It positions science not merely as an academic field, but as part of daily experience—thereby strengthening cultural identity. Through this lens, students can relate science learning to their environment, making it more meaningful and relevant (Bachri et al., 2024). This is reinforced by Alviya et al. (2023), who found that learning resources and media rooted in ethnoscience improve local knowledge and increase the learning engagement of elementary students.

Previous studies have shown that nonverbal

memory—particularly related to pitch and rhythmic patterns—engages different cognitive mechanisms from verbal memory, laying a foundation for integrating traditional musical instruments into science education (Jiang et al., 2024). This is particularly effective in sound-related topics. The inclusion of musical instruments like *angklung*, *saluang*, *kecapi* (*kabosi*), *kendang*, and *tifa* links scientific knowledge with local culture, strengthening students' grasp of scientific concepts in a culturally contextualized way (Wu & Cacciafoco, 2024).

From the findings, several traditional instruments were found suitable for integrating with grade IV elementary science material on sound. For example, *angklung* is not only a cultural symbol in Sundanese rice rituals but also an excellent medium for teaching audiosonic sound vibrations ranging between 20 Hz to 20,000 Hz (Suwantin, 2023). Technically, *angklung* is an idiophone instrument made from bamboo, where the sound source is the vibrating body of the instrument itself (Sjamsuddin & Winitasmita, 1986). The *angklung* works by shifting bamboo tubes to produce resonance, similar to the principle of organ pipes (Aulliyah et al., 2023). The shifting bamboo creates a unique pitch depending on the size and length of the tubes (Sumaludin, 2015), forming harmonization in an ensemble performance due to the interdependence of tones (Wiramihardja, 2011).

Similarly, *saluang* from West Sumatra, made of *talang* bamboo (*Schizostachyum brachycladum* Kurz) (Khuluq, 2016), demonstrates the use of circular breathing techniques (*manyisiahan angok*) that allow uninterrupted sound production (Muhammad, 2020). Historically, the *saluang* developed from the earlier *Sodam*, a flute made from rice stalks with only four holes, which evolved to six holes to allow richer rhythmic patterns (Purnomo & Aulia, 2020). The tones fall within the audiosonic category (Suwantin, 2023), making it an ideal example in lessons about how sound is produced and propagated through air vibrations.

The *kecapi*, also known as *kabosi* in Southeast Sulawesi, is a plucked-string instrument linked to Bugis maritime traditions. It is believed to have migrated with Bugis sailors and was shaped by seafaring culture (Ihsan, 2015; Tobing, 1961). In performances, it accompanies traditional songs and dances (Nita & Leonardo, 2021). Scientifically, the harp demonstrates how string vibration produces sound waves. The tension, length, and thickness of the strings affect pitch, and the resulting sound is categorized as audiosonic (Suwantin, 2023).

The *kendang* has existed since the 9th century and is known by various names such as *mrdangga*, *muraja*, and *gendan g* (Nita & Leonardo, 2021). There are

wooden and copper types, but wooden *kendang*, especially from jackfruit wood, is preferred due to its resonance quality and durability (Fatkhurrohman, 2017). Philosophically, the *kendang* symbolizes human devotion and alertness. Played with the palm of the hand, the *kendang* is a rhythmic leader in gamelan ensembles (Andarini, 2019) and supports structured rhythmic patterns (Ariyarso, 2018). The membrane vibrates when struck, producing sound waves within the human hearing range (Suwantin, 2023).

The *tifa*, native to Papua and Maluku, has strong spiritual and ritual significance. Its origin is linked to folklore about two brothers, Fraimun and Sarenbayer, who discovered its resonance in a decaying *Opsur* tree trunk (Tasarane et al., 2022). It is used in traditional ceremonies, performances, and dances. Structurally similar to a drum, the *tifa* produces audiosonic sound through stretched animal skin and hollow wood resonance (Suwantin, 2023). Its role in rituals highlights the link between musical vibration and cultural values. In addition to instruments, traditional dances also embody rich scientific and cultural content, particularly relating to force and motion in themes 7 and 8 of the fourth-grade curriculum.

The Plate Dance (*Tari Piring*) from West Sumatra symbolizes gratitude, cooperation, and hospitality (Santoso & Wimbrayardi, 2019). Dancers perform jumps and dynamic footwork while balancing plates, demonstrating muscle force and spring force. These movements illustrate the concept of force as muscle contractions create displacement, and spring force is represented in jumping movements.

The Candle Dance (*Tari Lilin*) emphasizes caution and precision, rooted in spiritual symbolism and traditionally performed in palaces and ceremonies (Putri et al., 2022). The dancers' twisting and bending involve controlled muscle force, while gentle elastic movement reflects spring force, resembling the contract-relax cycle (Kusumawati, 2017). The Padupa (Bosara) Dance of South Sulawesi teaches values of respect and hospitality, symbolized by offering *bosaratrays* filled with food (Zulham, 2018). Movements such as stepping, bowing, and spreading gestures require muscle force, while flowing gestures like picking flowers involve spring-like rebound, providing a clear physical example of energy release and recovery (Kusumawati, 2017).

Conclusion

The research shows that the application of ethnoscience in science learning in grade IV elementary schools can be found in theme 1, which discusses material about sound and connects with cultural values in the form of traditional musical instruments, such as

angklung, saluang, harp, drum, and tifa. Meanwhile, in theme 7 and theme 8 the material about style and movement is connected to cultural values reflected in traditional movements, such as plate dance, candle dance, padupa dance. This integration aims to enrich students' understanding of science concepts through relevant cultural contexts.

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Conflicts of Interest

The authors declare no conflict of interest.

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