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Teachers' Challenges in Integrating Ethnoscience Values into Elementary School Science Learning

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Abstract
This study aims to analyze the challenges faced by teachers in integrating ethnoscience values into Natural Science (Science) learning at SDN 3 Sila. This study employed a qualitative approach with a single-case study design. The research subject was the fourth-grade teacher, while students served as supporting informants. Data were collected through observations and interviews with the teacher and students. Data analysis used the Miles and Huberman interactive model, which consists of data reduction, data presentation, and conclusion drawing. The results showed that the teacher had integrated local knowledge and culture into science learning, including coconut oil production, rice cultivation, the use of leaves as medicine, and bamboo weaving. However, the teacher still faced several challenges, namely a limited understanding of ethnoscience concepts, difficulties in connecting local cultural practices with scientific concepts, limited learning resources and media, and a lack of training. Students also experienced difficulties understanding unfamiliar terms and concepts, but showed greater interest in learning activities involving pictures, concrete objects, videos, stories, and hands-on practices. Therefore, teacher training, the provision of adequate learning resources, and school support are needed to ensure that ethnoscience integration in science learning can be implemented systematically and effectively.

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1. INTRODUCTION

Ethnoscience values encompass the integration of local cultural knowledge with science-based education, aiming to deepen understanding and appreciation of cultural heritage and scientific concepts. This approach has proven to be highly effective in educational contexts, as it can enhance student engagement, strengthen cultural identity, and encourage the development of traditional values and environmental awareness. Ethnoscience serves as a bridge between traditional knowledge and modern science education, thereby providing students with contextual and meaningful learning experiences [1]. Ethnoscience can serve as a powerful tool in science education by incorporating local traditional values, such as the use of medicinal plants, traditional agricultural systems, and local wisdom in maintaining the balance of nature, into the curriculum. This integration helps strengthen students' scientific character while enhancing their understanding of the relationship between humans and the environment from an early age [2]. Science learning that integrates ethnoscience can enhance student engagement and foster cultural awareness, making education more relevant to students' local contexts [2].

Based on field conditions, there is a gap between the challenges teachers face in integrating ethnoscience values into science learning and their practical capabilities in

implementing this approach. Preliminary survey results indicate that most teachers have not yet understood the basic concepts of ethnoscience, have never received relevant training, and are not accustomed to developing teaching materials that incorporate local cultural values. Teachers tend to hesitate when explaining the scientific principles underlying local traditions due to limited training, a lack of supporting literature, and insufficient school policy support for developing ethnoscience-based learning[3].

One effective learning model for achieving this goal is an approach that integrates ethnoscience. In the context of education, ethnoscience is used to bridge modern scientific knowledge and local wisdom. This approach connects scientific concepts with students' cultural realities and experiences, making learning more contextual and relevant [3]. This is in line with [4] who explained that the ethnoscience approach in science learning has the potential to strengthen students' understanding of scientific concepts while instilling local cultural values. Furthermore, [5] demonstrated that the integration of ethnoscience into science learning can support the development of scientific literacy by connecting scientific concepts with local wisdom. Therefore, the ethnoscience approach not only helps students understand science content in a contextual manner but also has the potential to foster appreciation for local culture and support efforts to preserve it.

Several previous studies have focused more on examining the effectiveness of ethnoscience-based learning tools on students' learning outcomes and scientific literacy [6]. Recent studies have also been dominated by the development of learning media to improve students' critical thinking skills [7]. The main difference is that these studies tend to examine the impact of ethnoscience on students, whereas the present study focuses on the difficulties teachers face in the implementation process. Because this issue has not been extensively discussed from the perspective of practitioners, this study seeks to address this research gap by identifying the barriers teachers face in integrating local wisdom with formal scientific knowledge. Specifically, this study aims to examine the challenges teachers encounter in integrating ethnoscience values into elementary science education. Unlike previous studies that have primarily emphasized the benefits of ethnoscience, this study provides a comprehensive analysis of the obstacles faced by educators, offering practical insights that can be applied to improve pedagogical practices.

The urgency of this study stems from the importance of integrating ethnoscience values into science education to make the learning process more contextual and relevant while respecting local cultural wisdom and enhancing students' understanding of scientific concepts [8]. This study aims to identify the challenges teachers face in integrating ethnoscience values, analyze the underlying causes, and formulate recommendations to ensure more effective implementation of ethnoscience-based science education.

Ethnoscience bridges indigenous knowledge and modern science to make learning more contextual. It integrates local cultural knowledge into science education by connecting scientific concepts with students' practices and perspectives, making learning more relevant and engaging, increasing motivation, and positioning science as part of cultural heritage [9]. Furthermore, ethnoscience aims to stimulate students' interest in learning by emphasizing lessons related to everyday life and culture. This approach supports students in expanding their scientific knowledge through the culture that surrounds them [10]. This integration helps students not only understand theoretical scientific concepts but also recognize their practical applications in everyday life [11] Therefore, ethnoscience serves as a strategic instrument for making science education more meaningful and inclusive for elementary school students.

Teachers' competencies in integrating ethnoscience into science learning include understanding the basic concepts of ethnoscience, identifying local wisdom relevant to science content, and developing culturally based teaching materials. However, preliminary

surveys have revealed a significant gap, as most teachers lack an in-depth understanding of ethnoscience, have limited access to specialized training, and are not accustomed to connecting local traditions with valid scientific explanations [3]. The main contributing factors include limited supporting literature, insufficient school policy support, and teachers' uncertainty in connecting traditional practices with formal scientific principles, as confirmed through interviews with the school principal. These competencies are essential for overcoming implementation barriers, as competent teachers can transform ethnoscience into an effective integrated learning model, thereby enhancing the relevance of education to students' local contexts [8]. Developing teachers' competencies through training and institutional support is key to optimizing their role as facilitators of ethnoscience-based science education.

The characteristics of learning integrated with character education are not only oriented toward developing students' academic knowledge and skills but also toward fostering their moral and ethical values [12]. The integration of character education into learning can also help develop students' sense of responsibility and social awareness, enabling them to apply these values in community life [13], [14]**.** In the context of elementary education, meaningful learning can also encourage student engagement, strengthen cultural identity, and foster environmental values from an early age. This is consistent with the characteristics of elementary school science learning, which emphasizes direct and meaningful experiences through interactions with the surrounding environment, such as plants, animals, soil, water, and weather. These experiences can foster curiosity, conceptual understanding, motivation, and connections between learning materials and real-life situations. A contextual, active, and interactive approach provides students with opportunities to connect scientific knowledge with their everyday experiences and surrounding environment [15]. Thus, science learning in elementary schools not only plays a role in developing scientific knowledge and skills but also provides opportunities to integrate values derived from the environment, culture, and community life through an ethnoscience approach.

2. RESEARCH METHODS

This study employed a qualitative approach with a single-case study design. The research was conducted at SDN 3 Sila, with the fourth-grade homeroom teacher serving as the primary research subject. Fourth-grade students served as supporting informants to provide information regarding the implementation of learning activities. This single-case study focused on the challenges teachers face in integrating ethnoscience values into science learning. Data were collected through classroom observations to examine the ethnoscience learning process and interviews with the teacher and students to explore their experiences and the challenges encountered in implementing ethnoscience-based learning.

Data analysis followed the interactive model developed by Miles and Huberman, which consists of three stages: data reduction, data presentation, and conclusion drawing. Data reduction involved selecting and categorizing information obtained from interviews and observations according to the research focus. The reduced data were then presented in narrative form to facilitate understanding. The final stage involved drawing conclusions inductively by identifying patterns and themes in the data. The findings were verified through triangulation to ensure the validity of the research results.

3. RESULTS AND DISCUSSION

This study aims to analyze the challenges teachers face in integrating ethnoscience values into elementary school science learning. The research data were obtained through interviews and observations involving the fourth-grade teacher as the primary research

subject, as well as interviews with students. The data were used to examine the fourth-grade teacher's understanding of ethnoscience values, the forms of ethnoscience integration in science learning, the challenges encountered by the teacher, and the efforts made to overcome these challenges. The data were analyzed using a descriptive qualitative approach through three stages: data reduction, data presentation, and conclusion drawing. The results of the analysis were used to provide an in-depth description of the challenges teachers face in integrating ethnoscience values into elementary school science learning.

3.1.Research Results

a. Teachers' Understanding of Ethnoscience Values in Elementary School Science Learning

In the interview, the fourth-grade teacher explained that learning should be connected to everyday life to help students understand the subject matter more easily. The teacher provided an example of teaching changes in the states of matter by using objects and phenomena that students could observe directly. This understanding was also reflected in the students' learning experiences. The fourth-grade teacher, who served as the research subject, connected science topics with community activities, such as coconut oil production, rice cultivation, the use of leaves as medicinal plants, and bamboo weaving. The following is an excerpt from an interview with Nurhayati, S. Pd., Gr., a teacher at SDN 3 Sila:

"*I only became familiar with the term ethnoscience recently. However, I have previously connected science learning with students' everyday lives and the culture around them. For example, when discussing plants or the environment, I ask students to talk about plants they commonly see at home or how people in their community use these plants. Perhaps this can be considered ethnoscience, but I do not fully understand the concept yet.*"

Based on the interview results, it can be concluded that the fourth-grade teacher has implemented science learning connected to everyday life and local culture, such as the use of plants, coconut oil production, rice cultivation, and bamboo weaving. However, the teacher does not yet have a comprehensive understanding of the concept of ethnoscience. This indicates that the teacher has implemented basic ethnoscience-based learning practices but still requires further understanding and knowledge of ethnoscience to integrate it systematically into elementary school science learning.

b. Forms of Ethnoscience Value Integration in Elementary School Science Learning

The interview revealed that the fourth-grade teacher, who served as the research subject, integrated ethnoscience values through activities closely related to students' everyday lives, such as coconut oil production, rice cultivation, the use of leaves as medicinal plants, and bamboo weaving. These activities were used as examples to explain the learning materials.

The fourth-grade teacher also used experiences that students could observe directly to help them understand the learning materials. Thus, the form of ethnoscience integration identified in this study involved using local practices and knowledge as a context for explaining science concepts. The following is an excerpt from an interview with Nurhayati, S. Pd., Gr., a teacher at SDN 3 Sila:

"When learning is connected to things the students are familiar with, they are usually more enthusiastic. They share more stories about their experiences at home or in their surrounding environment, and the classroom becomes more active compared to when I only explain the material from the textbook."

Based on the research data, this integration was primarily reflected in connecting local practices with learning materials through examples, without yet demonstrating a systematic mapping of each ethnoscience practice to specific scientific concepts and learning objectives. This indicates that ethnoscience integration has already been implemented but could still be developed further to make it more structured and purposeful.

c. Teachers' Challenges in Integrating Ethnoscience Values into Elementary School Science Learning

Based on the results of observations, questionnaires, and interviews, the challenges teachers face in integrating ethnoscience values are primarily related to difficulties in connecting local knowledge and practices with science content and competencies. The fourth-grade teacher was familiar with several local practices that could be incorporated into learning activities but still experienced difficulties in establishing appropriate connections between these practices and scientific concepts. In addition, the fourth-grade teacher faced challenges in selecting suitable examples and teaching methods for integrating ethnoscience. The teacher also expressed the need for further training in ethnoscience to improve their ability to develop ethnoscience-based science learning. The following is an excerpt from an interview with Nurhayati, S. Pd., Gr., a teacher at SDN 3 Sila:

"The main challenge I face is the lack of clear examples. I have also attended training on ethnoscience, but I still sometimes find it difficult to determine suitable learning materials. As a result, I tend to rely more on the existing textbooks, as well as the limited availability of facilities, such as student worksheets (LKS)."

From the students' perspective, some students still experience difficulties in understanding the material when teachers explain knowledge or practices that they have never encountered directly. Students prefer learning activities that involve pictures, concrete objects, stories, and observation activities. The following is an excerpt from a student interview:

STUDENT INTERVIEW SHEET (Jihan Fakira Putri)

NO	Questions	Descriptive
1.	Has your teacher ever explained ethnoscience during science lessons? If yes, what examples of ethnoscience has your teacher taught during science lessons?	*Yes, she has. My teacher has told us stories about making coconut oil, planting rice, and using leaves as medicine.*
2.	What do you think about science lessons that incorporate ethnoscience? Are they interesting or difficult to understand?	*In my opinion, learning about ethnoscience is like learning to draw traditional houses.*
3.	Is there any part of the lesson that confuses you when your teacher explains ethnoscience?	*I feel confused when my teacher explains the names of plants and their uses. I cannot remember all of them yet, especially when I have never seen the plants before.*
4.	What do you like about science lessons that integrate ethnoscience?	*I like it when my teacher brings real objects or shows pictures. I also enjoy learning while looking at examples.*

NO	Questions	Descriptive
5.	What do you dislike or find difficult to understand in these lessons?	*I don't like it when there is a lot of text to read. I prefer it when my teacher tells stories and invites us to observe objects in the classroom.*

STUDENT INTERVIEW SHEET (Al Fairuz)

NO	Questions	Descriptive
1.	Has your teacher ever explained ethnoscience during science lessons? If yes, what examples of ethnoscience has your teacher taught during science lessons?	*Yes, she has. My teacher has told us stories about making coconut oil, planting rice, and using leaves as medicine.*
2.	What do you think about science lessons that incorporate ethnoscience? Are they interesting or difficult to understand?	*I like learning this way because the examples can be found around my home. However, sometimes I do not understand when the explanations are too difficult.*
3.	Is there any part of the lesson that confuses you when your teacher explains ethnoscience?	*I am confused by the word ethnoscience.*
4.	What do you like about science lessons that integrate ethnoscience?	*I like it when my teacher brings real objects or shows pictures. I also enjoy learning while looking at examples.*
5.	What do you dislike or find difficult to understand in these lessons?	*I find it difficult to understand when I only listen to explanations and read books. I prefer learning through pictures, videos, and hands-on activities.*

Based on the observations and interviews, it can be concluded that teachers' problems in integrating ethnoscience values into science learning at SDN 3 Sila include a lack of understanding and experience, difficulties in connecting local practices with science concepts, limited examples of learning activities, and insufficient training and supporting facilities. From the students' perspective, difficulties include understanding the term ethnoscience, remembering the names and uses of plants, and understanding explanations that are too difficult. Students prefer learning through pictures, concrete objects, stories, videos, and hands-on activities. Therefore, improving teachers' competencies and using engaging, contextual learning media and methods are necessary to help students better understand the integration of ethnoscience into science learning.

3.2.Discussion

a. These findings indicate that the fourth-grade teacher involved in the study understands ethnoscience values by connecting learning materials with the knowledge and activities found in students' surrounding environment. This understanding is consistent with the concept of ethnoscience, which connects local knowledge with scientific concepts in learning. [16] demonstrates that community

knowledge and practices can be used as a context for science learning in elementary schools.

This finding is also supported by [17], who explain that the integration of ethnoscience into science learning can connect cultural knowledge with scientific concepts while strengthening the relationship between learning and local culture. Various forms of local wisdom are also known to be relevant to elementary science topics, such as the environment, food processing, agriculture, traditions, and traditional technology.

Based on these findings, the fourth-grade teacher's understanding in this study is reflected in the ability to connect learning materials with local experiences and knowledge that are closely related to students' daily lives. However, this understanding is still mainly demonstrated through connections between learning materials and everyday life and has not yet shown a systematic mapping of ethnoscience values into each topic and learning objective.

b. Ethnoscience integration is carried out by connecting practices found in the community with scientific concepts. [18] demonstrate that batik-making practices involve various scientific concepts, such as heat transfer, changes of state, diffusion, and evaporation, making them a contextual learning resource for elementary school students.

These findings are consistent with the present study. Activities such as making coconut oil, planting rice, using leaves for medicinal purposes, and weaving bamboo are local practices that can be used to connect students' experiences with scientific concepts. Thus, the fourth-grade teacher has integrated ethnoscience through local activities and knowledge found in the students' surrounding environment.

Based on the research data, this integration is still evident mainly in the form of connecting local practices with learning materials through examples, rather than systematically mapping each ethnoscience practice to specific scientific concepts and learning objectives. This indicates that ethnoscience integration has been implemented but can still be developed to make it more structured and focused.

c. The research findings indicate that the main problem faced by teachers is not a lack of familiarity with local knowledge, but rather the difficulty of systematically connecting such knowledge with scientific concepts. This is consistent with [19], who found that teachers still experience difficulties in implementing ethnoscience-based science learning, particularly in integrating learning materials with the surrounding environment and in the planning, implementation, and evaluation stages of learning.

Furthermore, [20] explain that ethnoscience-based learning does not merely use local culture as an example but also needs to connect community knowledge with scientific concepts. This finding reinforces the results of the present study, indicating that the local practices used by teachers need to be more clearly linked to science concepts and learning objectives.

This is also supported by [21], who found that integrating ethnoscience into elementary science learning can make learning more contextual. However, teacher training and school support are still needed to ensure that its implementation can be carried out optimally and sustainably.

Thus, the problems faced by the fourth-grade teacher in this study include difficulties in connecting local practices with scientific concepts, selecting appropriate examples and teaching methods, and improving competencies through ethnoscience-related training. These problems indicate that the fourth-grade teacher already has experience using local knowledge but still requires further support to make its integration more systematic.

4. CONCLUSION

Based on the research findings, it can be concluded that the fourth-grade teacher at SDN 3 Sila has made efforts to integrate ethnoscience values into science learning by utilizing local knowledge and culture, such as coconut oil production, rice cultivation, the use of leaves as medicine, and bamboo weaving. However, the teacher still faces several challenges, including a limited understanding of ethnoscience concepts, difficulties in connecting local culture with scientific concepts, limited learning media, and a lack of training. Meanwhile, students find it easier to understand the material through pictures, concrete objects, videos, stories, and hands-on activities. Therefore, improvements in teacher competence, the provision of adequate learning media, and school support are needed to ensure that ethnoscience-based science learning can be implemented more effectively and contextually, while enhancing students' understanding and preserving local culture.

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