



## TEACHER'S UNDERSTANDING OF ETHNOSCIENCE-BASED CHEMISTRY LEARNING IN PAPUA

Dewi Natalia Marpaung<sup>1,2\*</sup>, Heri Retnawati<sup>3</sup>, Retno Arianingrum<sup>4</sup>

<sup>1</sup> Educational Research and Evaluation, Universitas Negeri Yogyakarta  
Jl. Colombo No.1, Karang Malang, Caturtunggal, Kec. Depok, Kabupaten Sleman,  
Daerah Istimewa Yogyakarta 55281

<sup>2</sup> Chemistry Education Study Program, Faculty of Teacher Training and Education,  
Jl. Kamizaun Mopah Lama, Rimba Jaya, Kec. Merauke, Kabupaten Merauke, Papua  
99611

<sup>3</sup> Mathematics Education Study Program, Faculty of Teacher Training and  
Education, Universitas Negeri Yogyakarta  
Jl. Colombo No.1, Karang Malang, Caturtunggal, Kec. Depok, Kabupaten Sleman,  
Daerah Istimewa Yogyakarta 55281

<sup>4</sup> Chemistry Education Study Program, Faculty of Mathematics and Natural  
Sciences, Universitas Negeri Yogyakarta  
Jl. Colombo No.1, Karang Malang, Caturtunggal, Kec. Depok, Kabupaten Sleman,  
Daerah Istimewa Yogyakarta 55281

\*corresponding author: [marpaung\\_fkip@unmus.ac.id](mailto:marpaung_fkip@unmus.ac.id)

**Abstract.** This research aims to explore information regarding perceptions of chemistry teachers' understanding of the development of ethnoscience-based chemistry learning in the independent curriculum in Merauke. This research uses a qualitative method with survey and interview methods, especially focusing on the integration of local wisdom in chemistry learning. The participants in this study were 11 chemistry teachers who have implemented ethnoscience-based learning. Data was analyzed by reducing data, displaying data, drawing conclusions/verification. The aspects explored in this research consist of aspects of teachers' understanding of ethnoscience, use of local wisdom in learning, obstacles faced in implementation, availability of resources and materials, relevance to the curriculum, level of student involvement and teacher motivation in implementing ethnoscience. The research results show that the majority of teachers have positive perceptions of ethnoscience learning, especially in relation to student understanding and motivation in teaching. However, obstacles such as teachers' lack of understanding to relate chemistry material to local wisdom, availability of resources and materials are still lacking, not all material can be applied to local cultural wisdom. This indicates that ethnoscience has great potential to be improved to support the quality of chemistry learning, although more support is needed to optimize its implementation, especially training for teachers regarding understanding the application of ethnoscience in chemistry material.

**Keywords:** ethnoscience, local wisdom ,chemistry learning, Papua

## INTRODUCTION

Ethnoscience views knowledge as something that is not only universal but also deeply connected to the culture and traditions of the local community (Fahrozy et al., 2022). Indonesian national education has become a medium for culture and nationality, aiming to educate individuals with the necessary skills to maintain their social identity (Pratiwi et al., 2019). Simply put, education is a valuable lesson for children, encouraging them to think more critically and helping them develop the

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Published by: Program Studi Pendidikan Kimia FKIP Universitas Lambung Mangkurat  
How to Cite: Marpaung, D., N., Retnawati, H. & Arianingrum, R. (2025). Teacher's Understanding of Ethnoscience-Based Chemistry Learning in Papua. *QUANTUM: Jurnal Inovasi Pendidikan Sains*, 16(1), 1–8. <https://dx.doi.org/10.20527/quantum.v16i1.20780>

Article History:

Received : 21-10-2024, Accepted : 01-02-2025 Published : 14-06-2025

personality that teachers and parents desire (Suriadi et al., 2021). One subject that uses local culture as a means to achieve learning objectives in the era of the Merdeka curriculum is chemistry because it can link chemical concepts with local wisdom that already exists within the community, which is relevant to daily life, providing a more relevant context and increasing student motivation and engagement (Munandar et al., 2024). Chemistry plays a crucial role in daily life and is closely related to human activities and the surrounding environment. An approach that integrates the application of science in human life, where science and culture are interconnected to develop students' personalities, is called ethnoscience (Emda, 2023).

Ethnoscience plays an important role in education because it offers insights into natural sciences, including understanding the natural environment, the phenomena within it, and the natural occurrences that emerge (Fahrozy et al., 2022). In chemistry learning, the emphasis is on discoveries, not just an accumulation of facts, concepts, and principles contained within it (Hikmawati & Khusniati, 2022). The ethnoscience approach in chemistry learning allows students to see the relationship between science and local wisdom, helping them understand that scientific knowledge is not only universal but also develops in the context of local culture and environment (Dewi et al., 2019). One area with unique indigenous wisdom is Papua, which has its own distinct culture, especially in Merauke, located at the eastern tip of Indonesia, where there is a rich diversity in the social and cultural practices of the native Papuan people (Batigin et al., 2024).

From interviews conducted with indigenous people in Merauke, it was found that several local wisdoms exist, including traditional foods/local cuisine, ceremonial traditions, herbal plant processing, and handicraft making, all of which contain chemical processes. A literature study shows that these are similar to other regions in Indonesia but have unique characteristics in Papua. Further interviews were conducted with chemistry teachers in Merauke regarding their understanding of ethnoscience-based chemistry learning and its application in the classroom and local environment. Ethnoscience can be used as a concept in the chemistry learning process in classrooms because it is linked to wisdom, local culture, and the issues facing the community, making it closely related to chemistry learning. As a result, students are able to understand and implement the knowledge they learn in class to solve problems in their daily lives, making chemistry learning more meaningful. Learning that utilizes the cultural and social environment (ethnoscience) as a source of learning in everyday life can improve students' competence in using science (Handoko, 2020). Learning that utilizes the cultural and social environment (ethnoscience) as a source of learning in everyday life can improve students' competence in using science (Marpaung et al., 2019). Ethnoscience-based learning can enhance scientific thinking about local culture (Asmaningrum et al., 2021).

Interviews with chemistry teachers revealed that some had already connected chemistry topics with Papuan cultural contexts. An interview with a teacher at SMA Negeri 2 Merauke indicated that they had never heard of the term ethnoscience but had already linked chemistry content to the local wisdom of Merauke. Meanwhile, an interview with a teacher at SMA Negeri Khas Papua revealed that they were aware of the term ethnoscience and applied it in chemistry lessons, which motivated students more. Teachers' understanding of constructing the local culture of the indigenous Papuan people in Merauke is still limited and in the process of inventorying. This aligns with research conducted by Supriyadi & Nurvitasari (2019) regarding the inventory of science materials in Merauke's local community through direct interviews with the local people.

The learning process with the ethnoscience approach allows students to connect scientific concepts with real-life experiences, focusing not only on the accumulation of facts or mastery of theory but on the discovery and deeper understanding of natural phenomena around them (Lidi *et al.*, 2022). Ethnoscience aims to provide an in-depth experience in chemistry, resulting in changes in students' knowledge, understanding, skills, and attitudes toward chemistry (Sudarmin *et al.*, 2018). Therefore, ethnoscience-based learning can help students understand the material presented by the teacher. Indonesia's local wisdom, which contains indigenous science, can be integrated into science learning by exploring and identifying indigenous science, then reconstructing it into ethnoscience, which is original science with scientific explanations (Sudarmin, 2015; Lubis *et al.*, 2022).

Recent research in the field of ethnoscience has shown that in learning, teachers still emphasize scientific knowledge and have not integrated indigenous science into the learning process (Ramdiah *et al.*, 2020; Lia, 2022). If the science knowledge learned in schools can be perceived as beneficial for students' lives, they will be motivated to learn more about it. By linking scientific knowledge (modern science) with indigenous science (ethnoscience) in school science learning, students will likely find it easier to understand scientific concepts, which can improve their mastery of concepts and process skills (Hasanah *et al.*, 2021; Maryono *et al.*, 2021).

The ethnoscience approach is one concept that can help students understand chemistry material and its interpretation within the local environment by connecting local culture and its application in the teaching and learning process conducted by chemistry teachers. Therefore, this research is very important to explore the extent of teachers' understanding and knowledge of ethnoscience today.

## METHOD

The design of this research uses a qualitative approach with a survey method. Qualitative research is a comprehensive description that includes word analysis, informant opinions in detail, and studies conducted in a natural environment (Creswell, 2016). The participants in this study consisted of 11 chemistry teachers from high schools in Merauke, with 9 females and 2 males. In this case, the participants are teachers who have implemented ethnoscience in their chemistry lessons. The research data came from sources such as documentation in the form of surveys, interviews, and observations (Creswell, 2012). The data analysis technique was carried out by processing the results of interview transcripts, observation notes, and document reviews. Data was analyzed using the interactive analysis model proposed by Miles and Huberman (1994), which involves processes such as data reduction, data display, and drawing conclusions/verification.

Data analysis to find the proportion of relative frequency can use the equation from Sudijono's book (2018) as follows:

$$P = \frac{f}{N} \times 100 \%$$

Explanation:

P = Percentage sought

f = Frequency

N = Number of Respondents

In this study, the researcher used 3 categories to assess the teacher's perception and understanding of ethnoscience. The evaluation results were transformed into

categories of high, medium, and low. The reason for this is to have a more precise understanding of the categorization of aspects in the study, as shown in Table 1.

**Table 1. Perception percentage**

| No | Percentage | Category |
|----|------------|----------|
| 1  | 80% -100%  | High     |
| 2  | 51% - 80 % | Medium   |
| 3  | 0% - 50 %  | Low      |

(Azwar, 2009)

## RESEARCH RESULTS AND DISCUSSION

The focus of this study was carried out through surveys and interviews with 11 chemistry teachers who teach chemistry and work at schools that have already implemented the Merdeka curriculum. The understanding of chemistry teachers regarding ethnosience in chemistry lessons is the main topic of this research. The research was conducted in Merauke, South Papua province, at the eastern tip of Indonesia.

Science learning that is developed from the perspective of culture and local wisdom, structured and related to natural phenomena and events (ethnosience), will spark students' interest in science and will be easier to understand (Shidiq, 2016). Teacher perceptions were divided into 7 aspects and a survey and interviews were conducted to gather data on how well teachers understand ethnosience and other supporting aspects. This can be seen in Table 2.

**Table 2. Justification of teacher perception aspects in ethnosience-based chemistry learning**

| Perception Aspect                          | Description                                                                                                                                                                                                            |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Understanding of Ethnosience               | This aspect describes how well teachers understand the theory and concepts of ethnosience, which form the basis for integrating local culture into science learning.                                                   |
| Utilization of Local Wisdom                | This aspect describes how teachers assess the relevance and benefits of local wisdom to support the science learning process, and how ready they are to utilize local knowledge in an educational context.             |
| Implementation Barriers                    | This aspect describes the barriers experienced by teachers, including time constraints, lack of resources, or insufficient training, in implementing ethnosience in lessons.                                           |
| Availability of Resources and Materials    | This aspect describes how teachers access and utilize resources from the surrounding environment or local culture as learning media that support the integration of ethnosience.                                       |
| Relevance to the Curriculum                | This aspect represents the practical ability of teachers to design and implement teaching strategies that integrate ethnosience with the applicable curriculum.                                                        |
| Student Engagement Level                   | This aspect describes how ethnosience learning is able to motivate, inspire, and internalize science concepts in a way that is relevant and meaningful within the cultural context of the students.                    |
| Teacher Motivation in Applying Ethnosience | This aspect reflects the teacher's views on how ethnosience can enrich students' learning experiences, connect science with local wisdom, and enhance student motivation, making the learning process more meaningful. |

The division of teacher perception aspects into 7 categories in this research or survey of ethnoscience-based chemistry learning was conducted to explore in more depth the various dimensions that influence teachers' views and approaches to applying ethnoscience in teaching. Each of these aspects encompasses key elements that can illustrate teachers' understanding, attitudes, and practices in integrating ethnoscience into chemistry or science learning in general. This can be seen in Table 3.

**Table 3. Teacher understanding percentage in ethnoscience learning**

| Perception Aspect                           | Percentage | Category |
|---------------------------------------------|------------|----------|
| Understanding of Ethnoscience               | 55,9 %     | Low      |
| Use of Local Wisdom                         | 62 %       | Medium   |
| Implementation Barriers                     | 81,8%      | High     |
| Availability of Resources and Materials     | 57,7 %     | Low      |
| Relevance to the Curriculum                 | 90,9 %     | High     |
| Student Engagement Level                    | 83,8 %     | High     |
| Teacher Motivation in Applying Ethnoscience | 86,7 %     | High     |

Based on the analysis, the understanding of Ethnoscience shows a percentage of only 55.9%, meaning only half of the teachers understand ethnoscience, while the other half either do not fully understand it but have already implemented ethnoscience, though they feel further development is needed in its application. The use of Local Wisdom in Learning has a percentage of 62%, showing that the majority of teachers support the use of local wisdom, although there are challenges related to relevant teaching materials. Implementation Barriers, at 81.8%, indicate that most teachers report a lack of training and practical guidance on applying ethnoscience in chemistry lessons as a major obstacle. The availability of resources and supporting materials is at 57.7%, with teachers stating that the availability of resources and teaching materials is still limited, categorized as low. Relevance to the Curriculum shows a percentage of 90.9%, meaning that some teachers feel that ethnoscience is quite relevant to the curriculum, but it requires adjustments and time to be fully implemented for maximum effectiveness. Student Engagement, at 83.8%, shows that most teachers observe an increase in student engagement when material is connected to local culture. Teacher Motivation in Teaching Ethnoscience is at 86.7%, with teachers being highly motivated, especially to preserve local culture.

One of the main challenges in implementing ethnoscience in Merauke is the lack of supporting resources. Teaching materials that are relevant to local wisdom and modern science are very limited. Teachers often have to create their own materials or adapt the curriculum with resources that are not always available in the local context. This aligns with the findings of Rummar (2022) who states that limited resources are a common barrier in the implementation of learning based on local wisdom, especially in areas that do not yet have full access to adequate educational resources.

Teachers observe that ethnoscience has a positive impact on student engagement. By connecting science materials with local culture, students are more interested and can more easily understand the scientific concepts being taught. This is similar to the study conducted by Elfa *et al.*, (2024) on the potential of onion skin from the Dayak community as a natural indicator in chemistry experiments. This provides opportunities for improving the overall quality of science learning. Khoiriyah *et al.*, (2021) found that integrating local wisdom into science learning can improve student motivation and learning outcomes, especially because the material

becomes more relevant and easier to understand. In line with research by (Nabilatunnisa & Hernani, 2024) it is explained that local wisdom-based chemistry learning helps students become more critical, increases their curiosity, and encourages them to seek more information about chemistry learning, thereby automatically improving their literacy skills.

The essence of ethnoscience develops and grows from scientists and cultural experts, blending culture into knowledge, which takes the form of 1) describing indigenous science (native knowledge systems) which are the cultures of a group or community, 2) moral values or norms based on local cultural categorization, and 3) classification of local language, local terms, and local culture (Siregar, 2021). The embodiment of local cultural identity can be introduced as a source of learning in science (Hadi et al., 2019). In its implementation, there are problems and challenges in its application. The results of the analysis can be seen in Table 4.

**Table 4. Ethnoscience issues and opportunities**

| <b>Ethnoscience Issues</b>                                                       | <b>Opportunities</b>                                                                                         |
|----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Students today are starting to lose touch with local culture                     | Open up students' perspectives and literacy about local culture to foster cultural appreciation              |
| Not all local wisdom can be related to chemistry materials                       | Make science learning more enjoyable and engaging                                                            |
| No ethnoscience-based learning resources available                               | Provide learning resources based on the local culture of the community                                       |
| No local community activities are available for students to observe at all times | Open opportunities for the Merauke Education Office to hold exhibitions to introduce local wisdom of Merauke |

## CONCLUSION

Based on the research results, it can be concluded that the perception of teachers in Merauke regarding ethnoscience learning is generally very positive. The majority of teachers support the use of local wisdom in science education as it is believed to improve student understanding and the relevance of the material to the local cultural context. The high motivation of teachers in teaching ethnoscience shows a great potential to develop culture-based learning, which also plays an important role in character education for students.

However, this study also found several challenges, particularly related to the lack of available resources, relevant teaching materials, and support from the government and educational institutions. This support is essential to ensure that the implementation of ethnoscience can be carried out optimally and effectively in the classroom. Overall, ethnoscience has the potential to be further developed in the curriculum in Merauke. Therefore, strategic steps need to be taken, such as teacher training, providing appropriate teaching materials, and policy support from the government and educational institutions, so that the integration of ethnoscience in science education can run better and have a positive impact on the students' learning process.

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