# The Integration ESD and Ethnoscience to Merdeka Curriculum: Study on Junior High School

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**Abstract**

This research explored the implementation of ESD and ethnoscience-integrated learning in the Merdeka Curriculum at the junior high school in Cimahi City. Seventy out of 113 junior high school science teachers participated in this survey. Data collection was conducted using questionnaires followed by semi-structured interviews. Questionnaire data analysis employed percentage calculation techniques, while interview data were analyzed through data reduction, data presentation, and conclusion. It is found that 92.9% of teachers still need help understanding ESD and SDGs. Then, 95.7% of teachers know the benefits of connecting subject matter with students' socio-cultural environment, but they still need to understand ethnoscience. Only 7.1% of teachers have implemented ESD-integrated science learning, and 55.7% have implemented the Projects to Strengthen Pancasila Student Profile on Sustainable Lifestyle Theme in their schools. Only 4.3% of teachers have implemented ethnoscience-integrated science learning. The number of teachers who have implemented the Projects to Strengthen Pancasila Student Profile on Local Wisdom Theme is 60%. The main obstacle 90.2% of teachers face in implementing ESD-integrated science learning is that they still need to understand ESD and SDGs. Then, the main obstacle 92.9% of teachers face in implementing ethnoscience-integrated science learning is the difficulty in identifying local wisdom.

**Keywords**: ESD; Ethnoscience; Local Wisdom; Indigenous Knowledge; Teachers; Merdeka Curriculum; The Projects to Strengthen Pancasila Student Profile

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## INTRODUCTION

Based on preliminary studies, it is known that all junior high schools in Cimahi City have implemented the Merdeka Curriculum. Some schools have adopted its learning principles while still using the 2013 Curriculum, while others have fully integrated the principles and structure of the Merdeka Curriculum. Some schools have developed Operational Education Unit Curricula based on the Merdeka Curriculum. The learning principles of the Merdeka Curriculum include planning and implementing learning to build students' capacity as lifelong learners, learning designed according to students' contexts, environments, and cultures, and learning towards a sustainable future (Kemdikbudristek, 2022).

The structure of the junior high school curriculum is divided into intracurricular learning and the Projects to Strengthen Pancasila Student Profile. The projects are allocated approximately 25% of the total instructional hours annually. Intracurricular learning activities for subjects (including science) are based on learning outcomes. Meanwhile, the Projects to Strengthen Pancasila Student Profile are aimed at reinforcing efforts to achieve the Pancasila student profile, which is flexible in terms of content, activities, and implementation time (Kemdikbudristek, 2022). One of the seven themes of the Projects to Strengthen Pancasila Student Profile for junior high schools is Sustainable Lifestyle. The inclusion of Sustainable Lifestyle in the theme of the Projects to Strengthen Pancasila Student Profile is an effort by the government to provide more space for education for sustainable development (ESD) to serve as a means to achieve sustainable development goals (SDGs). ESD is an integral element of SDG 4 (quality education), which serves as the foundation and prerequisite for achieving other SDGs (Widodo et al., 2023).

Nevertheless, until now, there has been no specific subject of ESD in Indonesia. This condition can provide an opportunity for all subjects to incorporate ESD. When integrating ESD into the science curriculum, three dimensions must be considered: social, economic, and environmental. These three dimensions must be integrated into a cohesive unit to address sustainability issues (UNESCO, 2018).

In addition to a sustainable lifestyle, local wisdom is a theme that can be embraced in the Projects to Strengthen Pancasila Student Profile. A sustainable lifestyle emphasizes long-term thinking awareness. Such a lifestyle has existed since ancient times. It evolved from local wisdom generated from direct community interaction with the environment. This local wisdom contains indigenous knowledge with a rich context, which has the potential to contribute to understanding the relationship between the environment, socio-cultural aspects, and spirituality regarding life and nature (Zidny et al., 2020) and often includes scientific concepts that are not formalized. Such knowledge is termed ethnoscience (Wati et al., 2021), which encompasses fields such as agriculture (Kurnia et al., 2022), textiles (Khusniati et al., 2023), food (S. Li et al., 2012), environmental protection (Onrizal & Mansor, 2020), healthcare (Talib & Mohamed, 2020), construction (Kusuma, 2022), and others.

If ethnoscience fulfills the three dimensions of ESD (environmental, social, and economic), it can address sustainability issues that are important to solve as early as possible. Therefore, ethnoscience has been integrated into curricula across various continents, including Asia (Kiwfo et al., 2021), America (Chinn, 2014), Africa (Botha, 2012), and Australia (Bullen & Roberts, 2018). This ethnoscience approach encourages exploring the utilization of natural resources to achieve sustainability. Thus, integrating ethnoscience into ESD learning is essential to open up more significant opportunities for achieving the SDGs (Sandoval-Rivera, 2020).

Furthermore, learning that integrates local potential and wisdom positively instills strong character values in students, which can contribute to realizing of a character-based nation (Asrial et al., 2022). Implementing learning based on local wisdom or local potential is expected to positively impact students' understanding of concepts and attitudes, thus instilling sustainability concepts in students (Sriyati et al., 2023).

Various previous studies have revealed that teachers play a vital role as transformative agents who promote the achievement of sustainable development goals for students and society (Brandt et al., 2022; Costa et al., 2023; Edwards, 2020; Hamwy et al., 2023). Unfortunately, in Indonesia, there are no teachers with backgrounds in ESD (Eliyawati et al., 2023b). Not only that, teachers also need to receive ethnoscience teaching training to

implement such learning in the classroom, thus making learning more meaningful and impacting the improvement of student learning outcomes (Kasi, 2023).

Based on the actual situation and theories, a research gap has been identified: teachers who implement SDGs integrated learning in intracurricular and co-curricular activities (Project to Strengthen Pancasila Student Profile) do not have a background in ESD and still need to receive ethnoscience teaching training. Therefore, this research brings novelty in investigating the integration of ESD and ethnoscience in science learning and the Projects to Strengthen Pancasila Student Profile in the Merdeka Curriculum (the Sustainability Lifestyle Theme and Local Wisdom Theme) at the junior high school in Cimahi City by science teachers who do not have an educational background in ESD and ethnoscience. The research questions for this survey are: (1) How do junior high school science teachers in Cimahi City perceive ESD and ethnoscience?; (2) How do junior high school science teachers in Cimahi City integrate ESD and ethnoscience into learning activities?; (3) What challenges do junior high school science teachers in Cimahi City face in integrating ESD and ethnoscience into learning activities? The objectives of this research are: (1) To analyze the perceptions of junior high school science teachers in Cimahi City regarding ESD and ethnoscience; (2) To analyze the integration of ESD and ethnoscience into learning activities; (3) To identify the challenges faced by junior high school science teachers in Cimahi City in integrating ESD and ethnoscience to learning activities.

## METHOD

This research applied a survey method. The survey is a series of research procedures to sample the entire population to describe attitudes, opinions, behaviours, beliefs, or characteristics of that population (Creswell & Guetterman, 2019) by studying samples from the population (Fowler, 2008). In this procedure, researchers collect quantitative data using questionnaires or interviews and analyze the data statistically to describe trends in responses to questions and to test research questions or hypotheses (Creswell & Guetterman, 2019). Then, the data collection results through the questionnaire were followed up with interviews. Interviews were conducted to obtain more detailed results from the findings obtained from the questionnaire. The research procedure was carried out in the following stages.

**Stage 1** was conducted in the first week of October 2023. A Google Form questionnaire was distributed to science teachers in Cimahi City who work in 47 junior high schools, both public and private. A total of 70 teachers became research respondents from a population of 113 teachers. Respondents answered five questions about personal data and then answered true-false, multiple-choice, and check-box questions. The authors prepared the questionnaire and validated it for readability by three teachers before being distributed. The questionnaire framework is listed in Table 1.

Table 1. The Questionnaire Framework

| Aspects | Indicators | Question Numbers |
|---|---|---|
| ESD | Understanding of ESD | 1-2 |
| | Understanding of SDGs | 3-4 |
| | Implementation of ESD-integrated science learning | 5-6 |
| | Challenges in implementing ESD-integrated science teaching | 7 |
| | Participation in ESD Training | 8 |
| | Implementation of the Projects to Strengthen Pancasila Student Profile on Sustainable Lifestyle Theme | 9-10 |
| Ethno-science | Understanding of ethnoscience | 11-12 |
| | Implementation of ethnoscience-integrated science learning | 13-14 |
| | Challenges in implementing ethnoscience-integrated science teaching | 15 |
| | Participation in ethnoscience training | 16 |
| | Implementation of Strengthening Student Pancasila Profile Project on Local Wisdom Theme | 17-18 |
| ESD and | Implementation of ESD-ethnoscience | 19-20 |

| | |
|---|---|
| Ethno-science | integrated science learning |

Then, the demographic data of the respondents was obtained from questionnaire as follows.

Table 2. Demographic Data of Respondents

| No. | Aspects | Responses |
|---|---|---|
| 1. | Workplace/ Institution | 47 schools |
| 2 | Gender | Male =12. 9%<br>Female = 87. 1 % |
| 3 | Age (Years) | 18-25 = 11.3%<br>26-30 = 15.5 %<br>31-40 = 12.7 %<br>41-50 = 26.8 %<br>Over 50 =33.8 % |
| 4 | Teaching Experience | Less than 1 year = 8.5 %<br>1-5 years = 21.1 %<br>6-10 years = 8.5 %<br>11-20 years = 25.4 %<br>Over 20 years = 36.6 % |
| 5 | Highest Education | Diploma III = 1.4 %<br>Bachelor = 60 %<br>Master = 14 %<br>Science = 97.2 %<br>Non-Science = 2.8 % |

**Stage 2:** In this stage, questionnaire data analysis was conducted to obtain quantitative results. The research findings obtained from the data analysis include the percentage of respondents (quantitative data), which was calculated using percentage techniques for each question item.

**Stage 3:** In this stage, the researcher determined the questionnaire results that needed further explanation. Findings from the questionnaire were still general; thus, interviews were needed to delve deeper into information from science teachers who stated that they had implemented (1) ESD-integrated science teaching, (2) ethnoscience-integrated science teaching, (3) ESD-ethnoscience-integrated science teaching; (4) the Projects to Strengthen Pancasila Student Profile on Sustainable Lifestyle theme; (5) the Projects to Strengthen Pancasila Student Profile on Local Wisdom Theme.

**Stage 4:** The researcher conducted semi-structured interviews with the teachers, as mentioned earlier in this stage. Semi-structured interviews aimed to explore information related to the description of teaching activities. Information collected through interviews included topics covered, teaching methods, and assessment of teaching. These interviews were conducted in person or via WhatsApp in the third week of October 2023.

**Stage 5:** In this stage, the researcher analyzes the interview results. The analysis is conducted by reducing data, presenting data, and drawing conclusions/verification.

**Stage 6:** In this stage, the researcher interprets the interview data. This stage was conducted to explain the questionnaire results.

## RESULT AND DISCUSSION

The results and discussion in this paper are divided into three parts: the views of junior high school science teachers on ESD and ethnoscience; the integration ESD and ethnoscience to learning; the challenges in the integration ESD and ethnoscience to learning.

### Analysis of Junior High School Science Teacher's Views on ESD and Ethnoscience

The views of junior high school science teachers in Cimahi City on ESD can be seen in the following diagram.

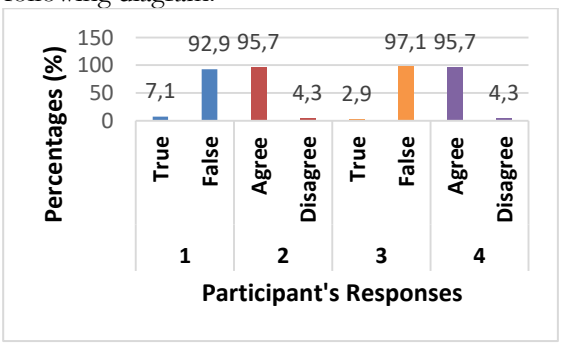



Figure 1. Bar Graph of Junior High School Science Teachers' Views Regarding ESD and SDGs

From Figure 1, the teachers' responses to questions number 1-4 can be seen. The majority of science teachers (92.9%) consider the statement that ESD is interdisciplinary education that promotes changes in knowledge, attitudes, and skills (critical thinking, systemic thinking, and collaboration) and encourages lifelong learning in addressing sustainable development issues and maintaining a balance between environmental, economic, and social

aspects, as well as encouraging changes in community behavior towards sustainability actions is a false statement (question 1). However, 95.7% of teachers agree that science education must equip students with knowledge, skills, and attitudes to meet current needs without sacrificing the needs of future generations (question 2). Furthermore, 97.1% considered the statement that "the Sustainable Development Goals (SDGs) are 17 global Goals agreed upon by United Nations member states to end poverty, protect the planet, and ensure that all people live in peace and prosperity" as incorrect (Question 3), even though the statement is correct. Nevertheless, 95.7% of teachers agree that the learning activities should be directed towards achieving sustainable development goals (question 4). Based on the respondents' answers, most teachers must fully understand ESD and SDGs. The need for more understanding among teachers about ESD and SDGs poses a challenge to teaching SDGs in the classroom (Eli et al., 2020; Liu, 2021; Nakidien et al., 2021). A study conducted by Anyolo et al. (Anyolo et al., 2018) found that teachers' perception of ESD influences how they teach the material. Inappropriate teacher perceptions of ESD can ultimately hinder the promotion of ESD (Alkaher & Carmi, 2019; Cebrián & Junyent, 2015). Various studies have shown that not only is understanding sustainability important for producing educators who can achieve SDG 4 (quality education), but other essential elements must also be fulfilled, namely strategies for managing behaviour, rules and policies, comprehensive principles, and skills in pedagogical skills (Jetly & Singh, 2019; Sunthonkanokpong & Murphy, 2019). Thus, institutions should integrate ESD into teacher education because teachers significantly impact transforming schools and communities (Hamwy et al., 2023).

Next, the views of junior high school science teachers in Cimahi City on ethnoscience can be seen in the following graph.

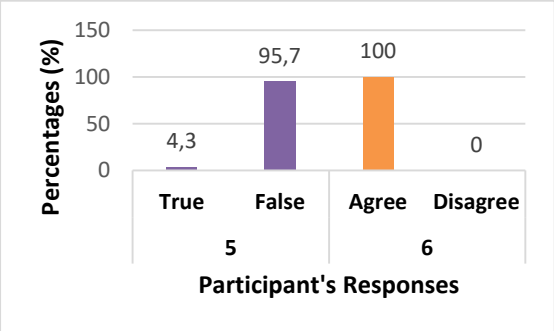
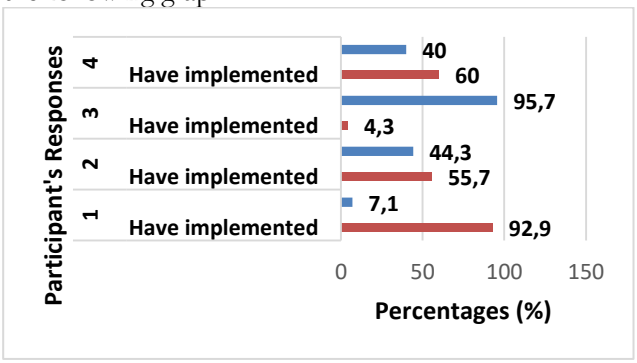



Figure 2. Bar Graph of Junior High School Science Teacher's Views on Ethnoscience

From Figure 2, the teachers' responses to questions number 5-6 can be seen. As many as 95.7% of the teachers considered the statement that "ethnoscience is knowledge held by ethnic groups/societies that can be explained by scientific science" as incorrect (question 5), even though the statement is correct. However, all teachers agree that it is essential to link science education with local culture (question 6). Based on the teachers' responses, it can be concluded that teachers recognize the benefits of connecting lesson materials with the socio-cultural environment of students, but they still need to understand ethnoscience. Learning based on local potential can cultivate students' appreciation for their local culture (Sakti et al., 2024). This condition can happen because students realize that the science they learn in school aligns with their daily lives.

## The Integration of ESD and Ethnoscience into Learning Activities

The percentage of junior high school science teachers in Cimahi City who have integrated ESD into learning activities (intracurricular and cocurricular) can be seen in the following graph.




Descriptions:
1 = ESD-integrated science learning
2 = The Projects to Strengthen Pancasila Student Profile on the Sustainability Lifestyle Theme
3 = Ethnoscience-integrated science learning
4 = The Projects to Strengthen Pancasila Student Profile on the Local Wisdom Theme

Figure 3. The Proportion of Science Teachers who Have Integrated ESD and Ethnoscience into Intracurricular and Cocurricular Programs

Based on Figure 3, only 7.1% (five science teachers) have implemented integrated

ESD teaching. Looking at their demographics, these teachers are female. From the questionnaire data obtained from these five teachers, it is known that they conducted lessons on Climate Change (5 teachers). This teaching was carried out to achieve SDG 13 (climate action). Furthermore, from the interview results, it was found that three teachers used experimentation and discussion methods. Meanwhile, two teachers chose to use demonstration and discussion methods. At the end of the lesson, students were asked to summarize the efforts needed to address climate change. These five teachers also integrated ESD into the Interaction Between Living Things and Environment and the Environmental Pollution lessons. Both lessons were conducted to achieve SDGs 14 (life below water) and 15 (life on land). Then, two teachers integrated ESD into lessons on the Human Respiratory System. This teaching was carried out to achieve SDG 3 (good health and well-being). Both teachers used group discussion methods. In the lesson, students were asked to gather as much information as possible about respiratory system diseases and find ways to maintain respiratory organ health. Through questionnaires and interviews, it was found that teachers gained knowledge about SDGs and ESD from training they attended in June-July 2023. A Teacher Training and Education Institution in Bandung City organized this training.

In implementing ESD teaching, teachers should use the following teaching methods (UNESCO, 2013): 1) Interdisciplinary and holistic; 2) Learner-centered and participatory; 3) Value-based, emphasizing critical thinking, and exploring all stakeholders; 4) Forward-looking, encouraging medium and long-term planning; 5) Locally relevant, promoting multilateral collaboration among schools, stakeholders, local authorities, scientific communities, private sectors, Non-governmental organization (NGO), etc., and uncovering global issues and relations as part of daily life, whether in small villages or big cities.

Active participatory learning methods stimulate students to reflect on their learning about sustainability. Participatory learning methods suitable for integrated ESD teaching include project-based, problem-based, and research-based learning (Nguyen, 2020). Fieldwork can also be chosen because it positively impacts students' attitudes and behaviours regarding sustainability (Jeronen et al., 2017; Z. Li et al., 2024).

The interview results showed that teachers must still direct students to take action for sustainability. Teachers also used assessment methods in oral tests and portfolio tasks; they have yet to use performance assessments to assess students' abilities. The essence of ESD-based science teaching is action-oriented learning and transformative learning. Action-oriented learning is based on students' experiences and thoughts in their daily lives relevant to the topics taught, while transformative learning is learning that can change students' perspectives to understand the sustainability issues of the earth better (Eliyawati et al., 2023a). In studies on ESD implementation in schools, teachers still do not understand the assessments conducted in teaching to achieve SDGs (Al-Kuwari et al., 2021; Edwards, 2020; Ssossé et al., 2021).

ESD is not only implemented in intracurricular activities but can also be applied in cocurricular activities (the Projects to Strengthen Pancasila Student Profile) of the Merdeka Curriculum. Figure 3 shows that 55.7% (39 teachers) have implemented the Projects to Strengthen Pancasila Student Profile on Sustainable Lifestyle Theme in their schools. Of these 39 teachers, four are male, and 35 are female. The Sustainable Lifestyle Strengthening Project for Students' Pancasila Profile aims to enable students to understand the impacts of human activities, both short-term and long-term, on life sustainability globally and in their immediate environment. Students also develop awareness to adopt environmentally friendly attitudes and behaviours, learn about potential sustainability crises in their surroundings, and develop readiness to address and mitigate them (Kemdikbudristek, 2022).

Interviews were conducted with one male teacher and four female teachers to explore their teaching activities. Teacher A (male) directs students to sort waste and process it into products with commercial value, such as banana peel or papaya peel chips. Meanwhile, two female teachers act as facilitators, guiding students to take action to reduce waste production by bringing refillable water bottles and food containers from home. Teachers B, C,

D, and E (all female) guide students to clean the school premises and sort organic and inorganic waste. The learning activities have built students' awareness of adopting environmentally friendly attitudes and behaviours. However, they have yet to be able to develop students' readiness to address and mitigate complex sustainability crises.

According to these five teachers, students enthusiastically participate in all activities during the learning process. However, after the activities, the sustainable lifestyle adopted by the students tends to diminish. This condition could be anticipated if school leaders and teachers continue encouraging students and providing exemplary sustainable lifestyles.

The percentage of junior high school science teachers in Cimahi City who have implemented integrated science teaching can be seen in Figure 3. It can be observed that the percentage of teachers who have implemented integrated science teaching with ethnoscience is 4.3% (3 teachers). These three teachers are all female. Subsequently, interviews were conducted to gather information about the teaching activities carried out by these three teachers. Teacher A integrates ethnoscience into the topic of the Digestive System. The teacher explains the ancestral advice that pamali ulah dahar bari saré (taboo, do not eat while lying down). From a scientific perspective, eating while lying down is not suitable for health as it can increase the risk of stomach acid (hydrochloric acid) rising to the oesophagus and causing heartburn. Additionally, lying down after eating contributes to symptoms of GERD (Fox & Gyawali, 2023). Teacher B integrates ethnoscience into the topic of Forces and Newton's Laws. During the lesson, students are asked to observe a video showing reog Ponorogo (a traditional Indonesian dance in an open arena that serves as folk entertainment and contains some magical elements) and then identify Newton's laws applicable to the dance movements. Teacher C integrates ethnoscience into the topic of Climate Change. The teacher directs students to find ways to address climate change and explains that bamboo trees can reduce carbon dioxide in the atmosphere, which includes greenhouse gases. Bamboo trees are one of the motifs in the batik of Cimahi City. Batik is an Indonesian technique of wax-resist dyeing applied to the whole cloth. The culture teachers adopt to be associated with science concepts is influenced by their backgrounds (Puspita et al., 2024). It is known that teachers A and C are from the Sundanese ethnic group, while teacher B is originally from Ponorogo (East Java). All three teachers have a background in education bachelor's degree. During their undergraduate studies, they never learned about ethnoscience. They acquired knowledge to integrate ethnoscience into science teaching from training organized by a Teacher Education Institution in May 2023.

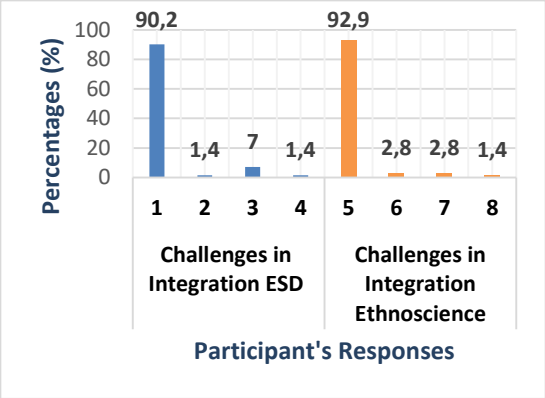
In Cimahi City, there is a traditional village, namely Cireundeu Traditional Village, which is rich in local wisdom, such as the staple food of the indigenous community, rasi, made from cassava (Adiputra et al., 2021), the presence of leuweung larangan or forbidden forests (Darmawan et al., 2022), etc. A question in the questionnaire was given to determine whether teachers have ever linked their teaching with the local wisdom of the Cireundeu community. None of the teachers have incorporated the local wisdom of the Cireundeu community into science teaching.

Ethnoscience is not only implemented in the intracurricular activities but can also be applied in the Projects to Strengthen Pancasila Student Profile. Figure 3 shows that 60% (42 teachers) have already implemented the Projects to Strengthen Pancasila Student Profile on the Local Wisdom Theme. Of the 42 teachers, four are male, and 38 are female. Subsequently, researchers conducted interviews with one male teacher and four female teachers. Teacher A, a male, directs students to create traditional foods and beverages such as "awug" (a steamed delicacy made from glutinous rice flour dough, grated coconut, and palm sugar wrapped in banana leaves), "wedang uwuh" (a traditional beverage typical of Yogyakarta made from various natural spices), "bajigur" (a traditional beverage typical of the Sundanese community made primarily from palm sugar and coconut milk), and others. He introduces the nutritional content and benefits of these traditional foods and beverages to the students. Teacher B guides students in creating batik motifs of cassava and bamboo plants, which are the local potential of the Cireundeu community. She explains the benefits of these plants to the students. Teacher C directs students to engage in traditional games

such as "egrang" (a traditional game that utilizes a pair of bamboo poles for walking) and "gatrik" (a traditional team game consisting of hitter and catcher teams, played in groups). She introduces the types of monocot plants used as traditional game tools. Teacher D instructs students to learn about various ethnic groups in Indonesia, including their food, clothing, and language. Teacher E guides students in making food from local ingredients such as cassava and explains the nutritional content of these ingredients. Among these five teachers, Teachers A, B, C, and E integrate ethnoscience into the Projects to Strengthen Pancasila Student Profile on the Local Wisdom Theme.

### Challenges Faced by Science Teachers in Cimahi City in Integrating ESD and Ethnoscience into Learning Activities

The main challenges teachers face in integrating ESD and ethnoscience into learning activities are presented in the following figure.




Descriptions:
1 = Lack of understanding of ESD and SDGs
2 = Lack of time to implement
3 = Lack of collaboration with parents and other stakeholders
4 = ESD is not a priority in minimum competency assessments
5 = Difficulty in identifying local potential/local wisdom
6 = Insufficient time to implement it
7 = Ethnosciences are not a priority in minimum competency assessments
8 = Uncertain whether ethnosciences are beneficial for students

Figure 4. Various Challenges Faced by Teachers in Integrating ESD and Ethnoscience into Teaching

Based on Figure 4, it is evident that most teachers (90.2%) have not yet understood ESD and SDGs, and 7% of teachers feel a lack of collaboration with parents and other stakeholders. Meanwhile, 1.4% of teachers feel a shortage of time to implement the learning, and another 1.4% consider ESD not a priority in minimum competency assessments. The interviews revealed that teachers perceive minimum competency assessment questions do not address sustainability issues.

This condition is similar to findings reported in previous studies that science teachers in Indonesia are not ready to integrate ESD into their teaching (Eliyawati et al., 2023b, 2022). The challenges faced by science teachers in Cimahi City are also consistent with the results of a survey conducted by UNESCO of 58,000 teachers worldwide, where one in four teachers stated that they need more support and training to learn about ESD (Education International, 2022). Previous research has revealed that there is still little professional training to implement SDGs (Corney, 2006; Eli et al., 2020; García-González et al., 2020). Regarding curricular challenges, research has shown that teachers lack access to SDGs teaching materials and resources (Kioupi & Voulvoulis, 2019; Leifler & Dahlin, 2020; Rashid, 2019; Waltner et al., 2020), lack helpful examples of how to incorporate SDGs into their teaching (Borg et al., 2012), and face a curriculum that is too packed (Fekih Zguir et al., 2022; Kioupi & Voulvoulis, 2019; UNESCO, 2021), time constraints (Conway et al., 2021; UNESCO, 2021), and heavy workload (Al-Thani et al., 2021; Kwee, 2021; UNESCO, 2021). The interviews also revealed that science teachers in Cimahi City have a weekly workload of 30-35 teaching hours. A study also highlights the importance of schools partnering with teacher training centres and other stakeholders to increase awareness and socialization and improve sustainable development practices in the community (Costa et al., 2023).

According to Figure 4, it is evident that 92.9% of teachers find it difficult to identify local potential/local wisdom, while 2.8% feel they lack sufficient time to carry out the teaching. Additionally, 2.8% of teachers consider integrated ethnoscience learning not a priority in minimum competency assessments. Furthermore, 1.4% of teachers express

uncertainty about the benefits of ethnoscience for students. Through interviews with teachers who consider these challenges the main challenges to integrating ethnoscience into learning, it was found that the questions in the Minimum Competency Assessment do not address local culture. Moreover, teachers who expressed uncertainty about the benefits of ethnoscience lack an understanding of what ethnoscience entails. However, they understand the positive impact of connecting lesson materials with the local wisdom present in students' environments. Most teachers find it difficult to identify local potential/wisdom. A solution to overcome this difficulty is providing support to science teachers through professional training. After the training, participating teachers have a better understanding of the characteristics of local wisdom-based learning or local potential-based learning, they become more sensitive in identifying local wisdom or local potentials in their respective areas, and the training can enhance teachers' insights into designing and implementing local wisdom-base learning or local potential-based learning (Sriyati et al., 2023).

## CONCLUSION

A significant proportion of teachers (92.9%) lack an understanding of Education for Sustainable Development (ESD) and Sustainable Development Goals (SDGs). While 95.7% recognize the benefits of linking lesson materials with students' socio-cultural contexts, they are not familiar with ethnoscience. Only 7.1% have implemented ESD-integrated science learning, and 55.7% have carried out Projects to Strengthen the Pancasila Student Profile on the Sustainable Lifestyle Theme. These activities aim to promote environmentally friendly attitudes among students but fall short in preparing them to handle complex sustainability issues. Ethnoscience-integrated science learning has been implemented by only 4.3% of teachers, while 60% have undertaken Projects to Strengthen the Pancasila Student Profile on the Local Wisdom Theme, often without integrating science concepts. The primary challenge for 90.2% of teachers in ESD-integrated science learning is their lack of knowledge about ESD and SDGs. Similarly, 92.9% find it difficult to identify local potential or wisdom for ethnoscience integration. Teachers need training to effectively integrate ESD and ethnoscience into their teaching. Further research is necessary to explore how advisory teachers can support science teachers in this integration.

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