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Integration of ethnoscience of Ijen Geopark Bondowoso area in elementary school science learning

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ABSTRACT

Ethnoscience learning is a new thing in the world of education in elementary schools. Ethnoscience interprets local community knowledge by linking culture with modern science. This study aimed to analyze the relationship of science materials with culture integrated into ethnoscience in the Ijen Geopark Bondowoso area. The method used in this research is qualitative, with data collection techniques of interviews, observation, and documentation. The research data analysis was carried out descriptively and qualitatively. The research subject is the Ijen Geopark Bondowoso area. The results show that ethnoscience can be integrated into science material in the Ijen Geopark Bondowoso area. Some of them are ethnoscience on coffee farming, which is included in plant material and plant reproduction, potato farming with automatic flush machines in force material, and the Wurung crater area, which is in ecosystem material. Integrating ethnoscience into elementary science learning can be done well in a lesson plan that hopes to improve science concepts and maintain cultural values around the environment.

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INTRODUCTION

Geological sites have an important role in the repertoire of scientific fields (Kubalíková et al., 2022; Rodrigues et al., 2021). Bondowoso district develops tourism potential to support the potential of Ijen as an Ijen Geopark area (Novitasari & Isnan, 2021). Ijen and Raung as a Global Geological Park (Geopark) The Ijen Geopark area is included in the Bondowoso and Banyuwangi regencies. In 2020, Bondowoso district proposed a Geopark in collaboration with Banyuwangi district, which was submitted to UNESCO. Presidential Regulation Number 9 of 2019 concerning the Development of

Earth Parks (Geoparks) is a single or combined geographic area that has valuable geological heritage sites and landscapes, geological diversity, biodiversity, and culture and is managed for conservation, education, and sustainable economic development that can be used to foster public understanding and concern for the earth and its surroundings (Permanadewi et al., 2024).

The Ijen area originates from one body of Mount Ijen, which is dominated by old Ijen rocks consisting of lava, breccia, and basalt-tuff, in addition to old Ijen rocks consisting of tuff, breccia, and lava. The rocks formed are characterized by texture and color. This is what states some natural appearances, such as Blawan Waterfall, one of which has a fault structure located at the northern end of the Caldera (Basuki et al., 2021; Berliandaldo & Fasa, 2022). One way to achieve this is by utilizing Geopark as a learning resource (Febby Fortuna & Ahmad, 2023; Nuralita, 2020; Rohaendi et al., 2023). In the Ijen Geopark area itself, cultures such as agriculture and plantations have a culture that is still maintained by the community despite the increasingly advanced globalization and technology.

Cultural values and science today are contradictory due to the development of science and technology. The rapid flow of globalization also makes cultural values increasingly eroded (Puspasari et al., 2019); some examples are the use of technology that makes people's mindsets change, the lack of cooperation, and the use of materials that impact soil conditions. This gives the impression that there is no relevance between the cultural values applied in today's society. On the other hand, science and technology facilitate human life while also having a negative impact. As a mediator, education is important to continue to be given because it contains aspects of attitude, knowledge, and skills. These three aspects are contained in learning at school, which has consequences in the form of changes in life and community needs. It also provides a forum for character from the community's cultural values. Strong collaboration between schools and technological advances is expected to form strong character and cultural values in students (Solissa et al., 2024). Integrating community cultural values is included in education and learning, one of which is in science. Integration of cultural values has been done unconsciously, which provides indirect benefits to students (Puspasari et al., 2019; Wahidah & Idrus, 2022).

Integrating science with cultural elements in learning is known as ethnoscience. The two terms have different meanings. Science is a science that is obtained systematically using a scientific approach in contrast to ethnoscience, which is knowledge from society as a socio-cultural understanding obtained in various ways, both scientific and non-scientific. The main foundation of ethnoscience refers to the notion of constructivism that allows students to learn for themselves, "*learning by doing*." The term impacts learners' concepts of the subject being studied to create meaningful meaning. Meaningful meaning from ethnoscience learning can be measured by cognitive evaluation (Puspasari et al., 2019). Utilizing the associated nature and culture will provide value and meaningfulness because students face real events (Liza & Dahlan, 2022).

Ethnoscience is the knowledge that teaches children to have teachers children have good attitudes, such as tolerance to other friends with different cultural backgrounds. Ethnoscience integrated into science learning will reconstruct the original knowledge of the community towards scientific knowledge. One example is integrating ethnoscience into student worksheets (Siami et al., 2023). Culture-based learning is needed for students to give a sense of love to their culture and nation (Parrish & Linder-vanberschot, 2010). In line with research from (Fitriyah & Wardani, 2022), local wisdom culture is able to

bring up a sense of love for the homeland and surrounding culture if integrated into learning. However, the sense of love for the nation's own culture is increasingly eroded due to outside culture and electronic media that have developed rapidly in recent years. Education will play a ling ethnoscientific knowledge to give students broad insights into the surrounding environment and its relationship with their culture.

Some research results regarding ethnoscience integrated into learning provide positive results. Integrating ethnoscience in learning can clearly illustrate the distinctiveness of teaching materials, classrooms, learning environments, learning methods, and culture-based learning approaches. The learning process will be effective if ethnoscience is integrated into learning themes as the main theme of learning. In addition, ethnoscience learning can foster character and cultural values in students (Hadi et al., 2019). For example, cultural knowledge related to traditional rituals, medicinal plants, houses, and other cultural knowledge relevant to the learning theme (Akmal, 2021). In addition to positively impacting cultural recognition, ethnoscience in science learning can also provide effective learning outcomes (Putri, et al., 2022). Community activities can also be integrated with science learning; one example is palm sugar production, which involves refining to make sugar (Sumake et al., 2016). Ethnoscience learning is also able to accommodate critical thinking skills (Deviana & Sulistyani, 2021).

Science is an external study of concepts, principles, laws, and theories from the discovery process (Kumala, 2016). The presentation of science concepts starts with phenomena in the environment so that students easily understand them. Integrating ethnoscience into science material can be implemented in several materials, including making roof tiles in the Jepara area (Najib, 2018), which integrates science material about temperature and heat. Salt making in the Madura area can also be used as a learning resource for single-substance material (Hadi & Ahied, 2017) and can foster student character. Ethnoscience learning has also been implemented in fish smoking activities in Demak related to the science material of energy and its changes (Perwitasari et al., 2017). Several studies that have several researchers have researched that ethnoscience can be integrated into science materials that can facilitate the diversity of each learner in various regions in Indonesia. The novelty of this research is to examine ethnoscience in the Ijen Geopark area and map what materials can be integrated into science materials in elementary schools.

The Ijen Geopark area is a conservation area in the Banyuwangi and Bondowoso regencies. The development of this area involves the concepts of education, conservation, local economic development, and environmental protection (Rahmasari & Parameswari, 2020). This development is a management system to preserve geological heritage, geological diversity, biodiversity, and cultural diversity carried out by the government and local communities sustainably, one of which is through education. Some cultural activities in the Ijen Geopark area are closely related to ethnoscience studies. In elementary schools around the Ijen area, science materials are only those in student books. There is no link and integration of ethnoscience with the Ijen Geopark area in science materials. This integration has the advantage of introducing the cultural values around the Ijen Geopark area and the concept of science material in elementary schools.

However, in reality, the learning process still tends to be separated from the process of cultural acculturation and science materials, which should be implemented together in learning. The lack of ethnoscience integration in science learning materials makes it a new thing in research. Based on the above problems, integrating ethnoscience into science learning is very beneficial regarding cultural recognition and essential material concepts.

With an original culture, the Ijen Geopark Bondowoso area can be used to implement ethnoscience learning in science learning. This study aims to analyze the relationship between science material and culture integrated in ethnoscience in the Ijen Geopark Bondowoso area.

METHODS

This type of research includes qualitative research describing a region's phenomenon. Descriptive explanations emphasize substantive theories based on empirical data. Researchers directly observe the situation in the field to provide accurate results. This study only describes descriptively the phenomena observed, both natural and artificial phenomena. This research tries to integrate ethnoscience into science learning in the Ijen Geopark area. The results of this research will provide an overview of activities, characteristics, similarities, and differences with other phenomena. The phenomena obtained will then be integrated into science materials.

The subject of this research is ethnoscience in the Bondowoso Ijen Geopark area, such as the Wurung Crater area, Belawan Hot Springs, and the Ijen Slope Crater, which can be used as science material. The methods used in this study were observation, interviews, and documentation. Interviews were conducted with several communities around the Ijen Geopark area related to daily activities related to science learning in elementary school. The people interviewed were coffee farmers, officers of the tourist areas of Wurung Crater, Blawan Waterfall, two teachers from SDN Jampit 2, and 1 teacher from SDN Sempol 1. Observation and documentation were used to see activities and some areas in the Ijen Geopark Bondowoso area.

The research steps consist of data collection, reduction, presentation, and conclusion drawing. The following steps were taken in the research.

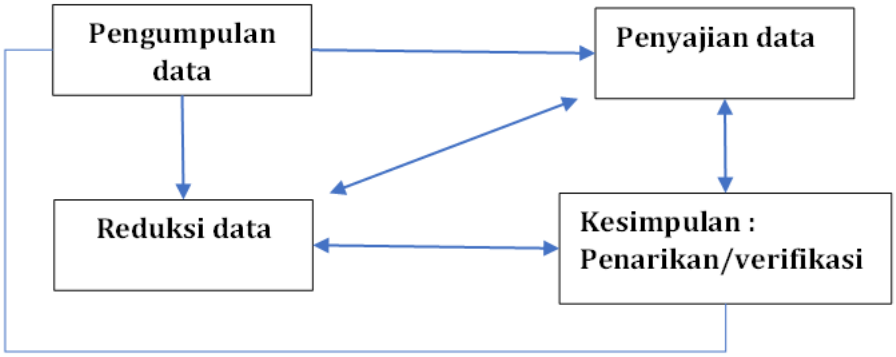

Figure 1: Research Steps

This research step begins with observation to see what is happening in the location of the Ijen Geopark area. Furthermore, structured interviews with the surrounding community were conducted. After some data is collected, data analysis is then carried out. DataData analysis does not directly get the desired results; it is obtained by reducing the amount of data obtained (Ahmad & Muslimah, 2021). Data analysis techniques use reduction, presentation, and withdrawal conclusions (Huberman, 2014). Reduction is the process of managing data after the research is carried out. Presentation is the result of data obtained and then processed and arranged systematically so that the data can be understood. At this stage of data presentation, there is a data verification step to recheck the data obtained. The last stage is concluding what has been obtained.

RESULTS AND DISCUSSION

The Ijen Geopark area where this research was conducted is a conservation area located in the Bondowoso and Banyuwangi areas that functions as an area of educational utilization, conservation, and tourism involving local communities. Ijen Geopark can be a learning resource (Febby Fortuna & Ahmad, 2023; Permanadewi et al., 2024). Ijen is one of the sites registered with Unesco as one of the heritage areas in Bondowoso (Rodrigues et al., 2021). The Ijen area consists of low and highlands, each area having characteristics that are related to nature and its use. Based on observations in the Ijen area, several areas can be integrated into science learning, some of which are coffee planting and agricultural crop cultivation. In addition, there is Tirta Agung tourist village that can be used for science learning in science material. The village is included in the Ijen Geopark development area (Mastika, 2023). The Ijen area includes a plateau with a unique topography that produces vegetation and ecosystems that support the habitat of endemic creatures of the Ijen region (Siddiq et al., 2023).

The results of interviews with communities around the Ijen geopark area show some activities that are still related to ethnoscience. Although the community does not understand the field of Natural Sciences, One of the community activities in the Ijen area includes coffee and potato farming. The coffee cultivated by the Ijen community is arabica coffee. Based on interviews with local people, the Ijen area is very suitable for this type of coffee plant because it is located at an altitude of around 1200 meters above sea level, and around the coffee plants are given shade plants that functions as protective coffee plants and direct light exposure, and naturally neutralize air temperature and humidity. Coffee planting in the Ijen Bondowoso area is one of the actions of farmers in coffee planting, namely planting lamtoro plants. The purpose of planting lamtoro plants is because the characteristics of coffee plant cultivation are not allowed to grow to a high level. The activities of the farming community in the Ijen area are an ethnoscience study. This scientific study is reconstructed into scientific science that can be accounted for in the community and has an impact on preserving the culture around the environment that is full of local wisdom (Lidi et al., 2022).

Another activity is potato farming, where potato plants are given automatic watering machines. Culturing crops such as potatoes, cabbage plants, and panchakarma plants is an ethnoscience study of the Ijen Geopark area. The cultivation of these plants is explored scientifically from seeding to harvesting, and they still use the local culture. Ethnoscience studies that include plant cultivation have been carried out on tobacco plants in the Jember area (Nailiyah et al., 2016).

Some activities from the community around Ijen Geopark can be integrated into science learning. Native community activities are included in the realm of ethnoscience studies. The connection between science and the culture of the Ijen community is an internalization of cultural values that combines indigenous science and science (Mayasari, 2017). This form of integration can be implemented in learning by designing lesson plans using an ethnoscience approach. One form of example is plant material. Teachers can plan learning by linking to the structure of coffee plants in Ijen Geopark. The implementation can be used by using models and methods tailored to the material to be taught to students.

Ethnoscience study is an integration between science and the culture of the surrounding community or, in other words, an *indigenous area*. Ethnoscience means culture for ethno and science for science. Ethnoscience is cultural knowledge and cognition owned by an ethnic or certain social group (Parmin, 2017). The knowledge

system of local communities is obtained through interactions between nature and surrounding culture, which is one of its elements (Ekowati et al., 2022). The results of the interaction between human culture and nature are reconstructed into scientific science that can be integrated into learning. The objectives of integrating ethnoscience include 1) getting to know the surrounding natural, social, and cultural environment; 2) providing provisions and abilities regarding environmental regional knowledge; 3) having a sense and attitude of behavior by the norms in the area and developing noble values of local culture (Akmal, 2021; Wahyu, 2017). From these objectives, it can be used to integrate ethnoscience into science learning in elementary schools.

The following are the results of the description of ethnoscience that can be implemented in elementary science materials

Table 1. Ethnoscience Mapping in the Ijen Region

No.	Ethnoscience in the Ijen Region	Science materials in elementary school
1	Coffee cultivation	Plants
2	Potato farming with automatic machines	Motion
3	Wurung Area	Natural resources and ecosystems
4	Hot spring	Caloric

Based on the table above, some ethnoscience in the Ijen Geopark area can be integrated with science materials. In some areas, ethnoscience has been applied to learning, one of which is in the Semarang area (Nuralita, 2020), such as the process of making herbal medicine, making noodles, the Kreo Cave area, and traditional Delman and becak tools. These activities have been implemented in science materials in elementary school, namely in the material of heat, sound, ecosystems, and various forces. This implemented learning will also increase cultural character values. Using ethnoscience in science learning is based on Piaget's learning theory (Ibe & Nwosu, 2018). The connection between culture and science material is one of the essence of cultural education and cultural internalization (Khoiri & Sunarno, 2018; Mayasari, 2017). Ethnoscience learning is based on recognizing culture as the basis for education and knowledge development (Pertiwi & Firdausi, 2019).

The ethnoscience of coffee cultivation in the Ijen Geopark area can be integrated into plant material. The material explains the structure of the coffee plant and its cultivation. The ethnoscience link here is that the community has a culture that plants lamtoro plants to maintain stability from sunlight. Potato farming using automatic machines has also become a community culture that integrates with technology. The link with science material is motion. The implementation is that students can analyze the machine of motion and calculate how long it takes to water the potato garden. The Wung crater in Ijen Geopark is one of the children of Ancient Ijen Mountain. The eruption of the mountain formed a crater with a landscape and abundant natural resources. This can be included in the natural resources and ecosystems material in science learning. Another landscape is hot springs, which can be related to heat material.

Ethnoscience as a cultural system containing a society's values, ideas, ideas, rules, and norms is very appropriate if integrated into the development of student character (Muslich, 2022). In addition, ethnoscience integrated into elementary science materials can be designed in lesson planning to improve concepts and science literacy (Dwiyanti & Rosana, 2020). Integration can also be applied in simple ethnoscience-based practicum (Zelisa Nudia Fitri, Abdul Syukur, Jamaludin, 2022), to improve students' process skills, as well as problem-based learning models for students' concept understanding abilities (Lidyawati, 2020), as well as the development of learning models to improve students'

critical thinking skills (Puspasari et al., 2019). Integrating ethnoscience into science materials can get good results for students in terms of learning outcomes, thinking skills, literacy, and attitude values.

CONCLUSION

Ethnoscience is an original science from the surrounding community based on activities carried out until now. Ethnoscience integration can be included or integrated into elementary school science learning. Some ethnoscience activities in the Ijen Bondowoso area are agricultural cultivation of coffee and potatoes, Blawan hot springs, and the Wurung Crater area, which can be integrated into science materials. The integration of ethnoscience will be more effective if it is included in the material and learning process; the impact obtained is expected to be an understanding of concepts, learning outcomes, thinking skills, cultural values, and attitudes in good students.

The research that has been done is still limited to observations and interviews with the people of the Ijen Geopark Bondowoso area; it is hoped that other researchers will develop ethnoscience-based learning tools that are effective and able to measure concept understanding, thinking skills, and cultural attitude values in schools that are useful for elementary school teachers. This research is also an initial research to study ethnoscience in the Ijen Geopark area. In addition, it is also necessary to develop an evaluation of the implementation of ethnoscience to see the effectiveness of the implementation of ethnoscience in science learning.

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