International Journal of STEM Education for Sustainability, Vol.5, No.2, 2025, pp. 257-261
e-ISSN 2798-5091. DOI. 10.52889/ijses.v5i2.696

Exploring Ethnoscience-Oriented PjBL-STEM Model Implementation in Biology Education: A Traditional Food Context Study

Submitted 18 June 2025, Revised 22 August 2025, Accepted 26 August 2025

Maritza Julianti[1*], Tiara Aina[2], Jesita Prasiwi[3], Indah Fatonatullaillah[4], Winda Widiyastuti[5], Usman Usman[6]

[1,2,3,4,5,6]Department of Biology Education, Faculty of Teacher Training and Education,
Universitas Sultan Ageng Tirtayasa, Serang, Indonesia
Corresponding Email: *2224220023@untirta.ac.id

Abstract

This study set out to investigate the application of the ethnoscience-focused PjBL-STEM model in biology education. By examining traditional meals as part of local wisdom, this methodology focuses on ethnoscientific values. A descriptive qualitative method incorporating literature review approaches was employed to investigate the idea, application, and future possibilities of this model. The study's findings suggest that PjBL, STEM, and ethnoscience can be combined to enhance the relevance, context, and cultural richness of education. Additionally, it has been demonstrated that this model fosters the growth of 21st-century abilities including critical thinking, creativity, communication, and teamwork as well as greater scientific literacy and learning motivation. Teachers serve as a link between local knowledge and contemporary science. Therefore, theethnoscience-oriented PjBL-STEM model can be an effective approach in realizing contextual, applied, and culturally rooted biology education.

Keywords: Ethnoscience-Oriented PjBL-STEM Model, Biology Learning, Traditional Food, Scientific Literacy

INTRODUCTION

Biology education as part of science should encourage students to understand concepts comprehensively, contextually, and in a way that is relevant to their lives. Biology topics related to the digestive system, nutrients, and metabolism can be linked to everyday phenomena, such as traditional foods. The application of a learning approach that integrates science and local culture is believed to foster interest and a sense of ownership toward the subject being studied (Lestari & Nabila, 2024). A possible alternative to improving 21st-century skills is to combine the integrated STEM approach with the Project-Based Learning (PjBL) model and maintain local values through ethnoscience (Syahrial, 2024). In education, integrated STEM is an approach that combines four main domains: mathematics, technology, science, and engineering. This method focuses on solving practical problems that people face in their daily work and life (Butar et al., 2024).

Traditional foods are a concrete form of cultural heritage that is rich in scientific value and has great potential as a medium for learning biology. Facts in the field show that biology learning still tends to be theoretical and lacks contextualization with the local cultural environment (Kelitubun et al., 2025). The use of learning resources that have not tapped into the potential of local wisdom causes students to struggle to understand the relevance of Biology material to their daily lives (Putri & Darussyamsu, 2021). Teachers also have not widely utilized innovative learning models that can combine the STEM approach with the

ethnoscience context (Al Idrus, 2022). This results in low student engagement and weak curiosity about the material being studied.

A solution to improve the quality of contextual and meaningful biology learning is an ethnoscience-oriented PjBL-STEM model. This model provides students with the opportunity to actively participate in projects related to their culture (Ishak et al., 2021). For example, students can learn about nutritional content or how to make traditional foods. The learning process becomes more authentic because students learn directly from their own social and cultural environment. Direct exploration helps students relate biological concepts to real-life practices in society. These activities also have the potential to foster 21st-century skills rooted in local cultural identity (Syahrial, 2024).

Previous studies have shown that the STEM-based PjBL model and ethnoscience approach can improve students' creativity, critical thinking, and communication skills (Sumarni, 2023). According to Carolina et al. (2024), local foods such as Seruit can support ethnoscience biology learning. However, most studies still discuss these techniques separately, and only a few comprehensively integrate them into the context of traditional foods (Munawwaroh et al., 2024; Kharisma et al., 2023). Additionally, there has been no in-depth qualitative research on how this model can be applied in biology classrooms, indicating a lack of necessary research to develop learning rooted in local culture, context, and meaning.

The aim of this study is to study how an ethnoscience-oriented PjBL-STEM model can be used for biology learning in a traditional food environment. Qualitative methods are used to look at experiences, views, and learning practices from the perspective of teachers and students. It is hoped that this research will provide a theoretical contribution to the process of creating a learning model that incorporates local values. Practically, the findings of this study can be used as a reference for building a more contextual, innovative, and useful biology learning model.

METHOD

This study used a descriptive qualitative approach and literature review method.

RESULTS AND DISCUSSION

The development of students' abilities is also influenced by the role of teachers as facilitators who connect local knowledge with modern scientific concepts (Ramadhan, 2024). In traditional food learning, teachers facilitate students' understanding of the biochemical process of fermentation in tempeh by integrating traditional community knowledge about the use of yeast and fermentation techniques. Teachers provide learning scaffolding through guided inquiry that directs students to explore the scientific aspects of local wisdom. As

cultural brokers, teachers facilitate dialogue between community leaders and students to obtain authentic knowledge about traditional foods. Teachers also act as technology integrators who guide students in using simple tools such as pH meters and microscopes to analyze the scientific aspects of traditional foods.

The ethnoscience-oriented PjBL-STEM model provides three main benefits in biology learning. First, science literacy is enhanced through the contextualization of material with local wisdom about traditional foods, enabling students to develop a deep understanding of biological concepts by relating them to concrete experiences in daily life. Second, learning motivation increases because the learning process becomes more relevant and meaningful. According to Dytaningtyas & Astuti (2025), the ethnoscience-based PjBL model increases students' creativity and learning outcomes, reinforced by Septiani & Listiyani (2021) who emphasize that “local wisdom can be applied in the form of teaching materials so that the content studied by students can be connected to what they experience in real life,” providing a theoretical foundation for the implementation of contextual learning. Third, the development of scientific process skills and the preservation of local culture. While developing an appreciation for local wisdom and the nutritional value of traditional foods as sustainable, healthy food alternatives, students learn to design experiments, analyze data, and draw conclusions based on evidence.

CONCLUSION

It has been proven that implementing a ethnoscience-oriented PjBL-STEM model in biology lessons, particularly regarding traditional foods, improves the quality of learning.

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