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TALES OF SCIENCE: THE TRANSFORMATIVE POWER OF FOLKLORE IN HIGHER EDUCATION BIOLOGY

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ABSTRACT

This research investigates the effectiveness of integrating folklore narratives into biology education within higher education as a pedagogical strategy to enhance scientific literacy and conceptual understanding. The study explores how folklore-based learning can improve students' comprehension of core biological concepts, including ecology, genetics, and biodiversity, by connecting abstract scientific principles to relatable cultural contexts. Through the analysis of various folklore traditions and their implicit biological principles, this study demonstrates the potential of these narratives to bridge the gap between theoretical biology and real-world applications. An experimental study was conducted to evaluate the impact of folklore-based instruction on student learning outcomes compared to traditional teaching methods. Results indicate significant improvements in student engagement, critical thinking skills, and conceptual understanding of biology among higher education students exposed to folklore-integrated lessons. This approach not only promotes cultural awareness and appreciation for traditional knowledge but also stimulates scientific discourse and problem-solving abilities. This study advocates for the incorporation of local folklore into science curricula within higher education to enrich student learning experiences and foster a deeper, more nuanced understanding of biology and its societal relevance, ultimately contributing to improved scientific literacy.

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INTRODUCTION

In today's rapidly advancing world, fostering a strong foundation in scientific literacy is crucial for undergraduate students, particularly in biology, to navigate complex issues and contribute to informed decision-making (Yacoubian, 2018). Traditional learning methods often struggle to connect abstract biological concepts with students' real-life experiences, leading to disengagement and gaps in understanding (Wu et al., 2018). An innovative approach gaining traction involves integrating cultural elements, such as folklore, into the science curriculum to provide context and relevance (Kristanto, 2019). Folklore, passed down through generations, reflects cultural values and often encapsulates significant ecological, biological, and environmental insights (Eko et al., 2020).

Folklore has served as an educational tool, especially in indigenous and rural communities, to impart knowledge about nature, the environment, and the living world (Wilujeng et al., 2019). These narratives commonly include themes of animal behavior, plant life, and ecological balance, offering a wealth of biological concepts that can align with scientific learning objectives (Dewi et al., 2019). For example, folk tales about specific plants or animals can illustrate complex concepts such as ecosystems, symbiosis, and evolutionary processes, which are central to many biology courses (Hubber & Ramseger, 2016). Moreover, these stories are often presented in a narrative format that captivates students' attention, providing a context that resonates with them emotionally and cognitively (Sumarni & Kadarwati, 2020).

The educational value of folklore lies in its potential to blend scientific knowledge with cultural narratives, creating a more meaningful and memorable learning experience (Chen & Tytler, 2016). When students encounter a story that explains the life cycle of a plant or the behavior of an animal within a familiar cultural context, they are more likely to remember and relate to the biological concepts being presented (Xudong & Li, 2020). This culturally relevant approach not only promotes understanding but also enhances critical thinking skills by encouraging students to make connections between their personal experiences and the scientific principles discussed in class (Yerrick & Ridgeway, 2017). Furthermore, folklore-based teaching methods can foster an inclusive learning environment, acknowledging the diverse cultural backgrounds of students and validating their identities through the curriculum.

Recent studies have explored the potential of using storytelling as a pedagogical tool in science education (Goorney et al., 2022; Gürsoy, 2021; Saritepeci, 2021). While these studies highlight the benefits of narrative-based learning, the specific application of folklore, with its deep cultural roots and traditional ecological knowledge, within the context of biology education in higher education remains underexplored.

This research seeks to fill this gap by examining the role of folk tales in enhancing biology students' understanding of key biological concepts in higher education. Through an experimental study, this research aims to demonstrate how folklore can be leveraged to improve students' grasp of biology while promoting scientific literacy and conceptual understanding. The study will explore the relevance of folklore in conveying concepts such as genetics, ecology, and biodiversity, and how these narratives can serve as a bridge between scientific knowledge and cultural understanding.

The significance of this study lies in its potential to transform biology education by integrating a more diverse, inclusive, and contextually rich pedagogical approach. By drawing upon the deep cultural and biological knowledge embedded in folklore, this research proposes a model of teaching that not only enhances scientific literacy and conceptual understanding but also nurtures a sense of belonging and cultural appreciation in the classroom. Ultimately, this approach offers a way to engage students more meaningfully in their learning and to encourage them to apply biological principles to real-world scenarios, thus enriching their educational experience.

METHOD

This study employed a pre-experimental, one-group pretest-posttest design to examine the effects of folklore-based instruction on undergraduate students' conceptual understanding of core biological principles and their scientific literacy skills. This design facilitated a direct comparison of student knowledge before and after the implementation

of the intervention (Creswell, 2014). While acknowledging the limitations of this approach in establishing causality due to the absence of a control group, the pre-experimental design was deemed appropriate for providing preliminary insights into the potential efficacy of this novel pedagogical strategy. This study contributes to the growing body of research on local wisdom-based learning in biology education, which seeks to connect scientific concepts to students' cultural contexts to enhance engagement and understanding.

The participant cohort comprised 40 undergraduate students enrolled in a biology education course. Participants were recruited via convenience sampling from within the course. Prior to their involvement, all participants provided informed consent, and they were assured of their right to withdraw from the study at any point without consequence.

The intervention consisted of six instructional sessions, each lasting approximately 120 minutes, which were integrated into the regularly scheduled biology education course. These sessions incorporated carefully selected folklore narratives that were thematically aligned with key biological concepts, including ecosystem dynamics, biodiversity, and ecological equilibrium. The folklore utilized in the intervention originated from well-known Indonesian folklores and some folklore unique to North Sumatera, reflecting the rich cultural heritage of the region and aligning with principles of ethnoecology, which promotes understanding of environmental attitudes through local culture.

Some of the folklores also incorporate taboos and superstitions related to nature, which are still practiced today. Instructional activities incorporated a variety of pedagogical approaches, including: (a) narrative presentations of the folklore; (b) facilitated group discussions exploring the implicit biological themes within the narratives; (c) analytical exercises designed to connect the folklore with established scientific principles; and (d) creative assignments requiring students to synthesize their understanding by linking folklore to contemporary scientific concepts. These activities were designed to support the development of student competencies such as environmental care, creative thinking, critical thinking, and problem-solving, which are vital for building the future generation that cares and protects the environment. The intervention was implemented by the researcher, who also acted as the course instructor.

The instruments employed in this study were designed to assess multiple dimensions of scientific literacy, aligning with indicators adapted from García-Carmona (2023) and informed by the PISA framework (OECD, 2019). These dimensions included: (a) identifying scientific problems relevant to biological concepts within folklore narratives; (b) explaining scientific phenomena related to ecosystems, biodiversity, and ecological balance; (c) using scientific evidence presented in the folklore to draw conclusions and make informed judgments; (d) information retrieval and synthesis from both folklore and scientific sources; (e) scientific reading and interpretation of texts and diagrams related to biological concepts; (f) scientific writing to articulate understanding and connections between folklore and science; (g) information representation through diagrams, charts, or other visual aids; and (h) knowledge presentation through oral or written reports (García-Carmona, 2023).

The conceptual understanding test primarily assessed dimensions (a), (b), and (c), while the engagement observation protocol focused on (d) through (h). Descriptive statistical techniques were used to analyze these aspects, providing insights into the effectiveness of folklore-based instruction in enhancing students' scientific literacy and conceptual comprehension.

RESULTS AND DISCUSSION

The findings of this study corroborate previous research that advocates for the integration of storytelling into science education as an effective strategy for enhancing student engagement and comprehension (Gürsoy, 2021; Saritepeci, 2021). The significant increase in post-test scores, as illustrated in Figure 1, indicates that incorporating folklore into biology lessons improves students' ability to connect scientific concepts with real-world contexts, thereby making learning more meaningful and memorable (Saefullah et al., 2017) .

To evaluate the impact of folklore-based scientific literacy on students' conceptual understanding, observations were conducted on

seven key indicators: Information Retrieval, Scientific Reading, Listening and Observing, Scientific Writing, Information Representation, Knowledge Presentation, and Problem Solving. These indicators were assessed before and after the intervention among 40 university students. The percentage increase in each category underscores the effectiveness of storytelling in enhancing student engagement and comprehension. Narrative-based learning strengthens cognitive retention and scientific reasoning (Kristanto, 2019; Ramdani et al., 2021). Figure 1 presents a comparative analysis of these indicators, demonstrating significant improvements following folklore-based instruction.

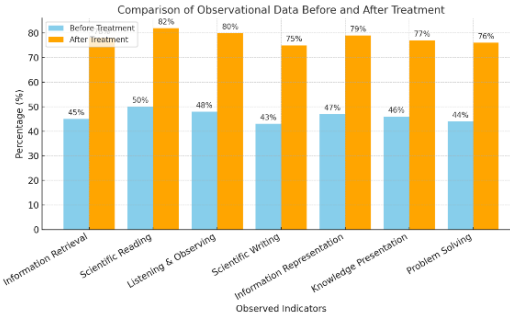

Figure 1. Results of multiple dimensions of scientific literacy

The integration of folklore into scientific literacy plays a crucial role in enhancing students' comprehension of biological concepts. Each of the seven observed indicators illustrates how storytelling can enrich various aspects of learning by linking cultural narratives with scientific principles.

Information Retrieval. This indicator pertains to students' ability to effectively gather and recall scientific knowledge. Within the framework of folklore-based learning, students interact with narratives that weave in biological elements, thereby enhancing their capacity to retrieve pertinent scientific facts through engaging storytelling. As illustrated in Figure 1, there was a notable increase in information retrieval scores, rising from 45% prior to the intervention to 70% following the treatment. This improvement suggests enhanced knowledge retention. These findings are consistent with existing research, which demonstrates that storytelling can significantly bolster knowledge retention by linking new information to familiar cultural contexts (Saritepeci, 2021).

Scientific Reading. This indicator reflects students' ability to critically analyze and comprehend biological texts. When folklore is employed as a medium for scientific literacy, students enhance their reading skills by interpreting the scientific meanings embedded within cultural narratives. The accompanying chart illustrates a significant increase in reading comprehension scores, rising from 50% to 82%. For instance, a folktale that describes the seasonal migration of animals enables students to extract ecological concepts from the narrative. This approach not only deepens their understanding of scientific materials but also aligns with research highlighting the role of storytelling in improving students' analytical skills in science education (Gürsoy, 2021).

Listening and Observing. These cognitive skills are crucial in biology education. Folklore-based instruction promotes active listening and encourages students to observe the connections between stories and biological principles. The observed increase in scores from 48% to 80% underscores the effectiveness of this instructional approach. For example, a narrative about plant adaptation in extreme environments prompts students to observe real-life examples in nature, thereby reinforcing their conceptual understanding. This method is consistent with prior research, which emphasizes that storytelling enhances observational learning by fostering curiosity and deep engagement with scientific phenomena (Kromka et al., 2020).

Scientific Writing. This indicator relates to students' ability to effectively structure and communicate biological concepts. By incorporating folklore into biology lessons, students learn to translate narrative-based knowledge into scientific explanations. The accompanying chart demonstrates a significant increase in writing skills, rising from 43% to 75%. For instance, after listening to a folktale about the medicinal properties of certain plants, students may be assigned the task of writing a scientific report on the biochemical compounds present in those plants. This process effectively bridges traditional knowledge with contemporary scientific discourse, thereby fostering well-structured scientific writing (García-Carmona, 2023).

Information Representation. This indicator pertains to students' ability to visually and conceptually depict biological data. Storytelling encourages learners to create diagrams, flowcharts, and conceptual maps that illustrate the scientific elements embedded within folk narratives. The increase in scores from 47% to 79% indicates a marked improvement in this area. For example, a story that explains the food chain within a rainforest ecosystem may inspire students to design an energy flow diagram that represents producer-consumer relationships. By visualizing knowledge through storytelling, students enhance their comprehension and make abstract biological concepts more tangible (Saritepeci, 2021).

Knowledge Presentation. This indicator reflects students' ability to articulate scientific concepts coherently. Storytelling enhances public speaking and explanatory skills, as students are encouraged to retell and analyze folk narratives in scientific terms. The observed increase in scores from 46% to 77% highlights the effectiveness of this approach. For instance, a student might present a folktale about symbiosis and subsequently explain its biological implications using real-world examples. This method promotes active learning by motivating students to organize and deliver information in a structured manner (Gürsoy, 2021).

Problem Solving. This critical skill in scientific literacy enables students to apply biological concepts to real-world challenges. Folklore-based learning enhances this skill by presenting stories that depict environmental or ecological dilemmas. The increase from 44% to 76% highlights the improvement in problem-solving abilities. For instance, a folktale about the impact of deforestation on local wildlife encourages students to propose conservation strategies based on scientific principles. Integrating storytelling into science education fosters critical thinking (Ramdani et al., 2021) and innovative problem-solving abilities (Kristanto, 2019).

Table 1. Results of the N-Gain Test for Conceptual Understanding and Problem-Solving Skills Following Folklore-Based Scientific Literacy Intervention

Indicators	Pre-test score	Post-test score	N-Gain (%)	Percentage
Conceptual Understanding	55	85	66.67	85%
Problem-solving skills	52	83	64.58	83%

Table 1 presents the N-Gain analysis, illustrating the improvement in students' conceptual understanding of biology following the implementation of folklore-based scientific literacy. Two key indicators were analyzed before and after the intervention: Conceptual Understanding and Problem-Solving Skills. The results indicate a significant increase in both indicators, with N-Gain values categorized as moderate to high. This improvement suggests that integrating folklore into science education effectively enhances students' ability to grasp complex biological concepts and apply them to problem-solving scenarios. These findings align with previous research, emphasizing the role of culturally relevant narratives in strengthening scientific literacy and cognitive engagement (Eko et al., 2020; Yerrick & Ridgeway, 2017).

CONCLUSION

The findings of this study provide compelling evidence for the effectiveness of integrating folklore into science education, particularly in enhancing students' conceptual understanding of biology and their problem-solving skills. The significant improvements observed in both conceptual understanding and problem-solving abilities, as indicated by the N-Gain analysis, underscore the potential of culturally relevant narratives to enrich the learning experience.

By utilizing storytelling as a pedagogical tool, educators can create a more engaging and meaningful learning environment that connects scientific concepts to students' cultural backgrounds. This approach not only fosters greater retention of knowledge but also encourages critical thinking and application of scientific principles to real-world challenges. The positive outcomes align with existing literature that advocates for narrative-based learning as a means to strengthen scientific literacy and cognitive engagement.

In conclusion, the integration of folklore into science education represents a valuable

strategy for improving student outcomes. Future research should explore the long-term effects of folklore-based instruction on scientific literacy and consider its application across various scientific disciplines. Additionally, educators are encouraged to develop and implement culturally relevant curricula that leverage storytelling to enhance student engagement and comprehension in science.

REFERENCES

Chen, H. L. S., & Tytler, R. (2016). Inquiry teaching and learning: Forms, approaches, and embedded views within and across cultures. In *Quality Teaching in Primary Science Education: Cross-cultural Perspectives* (pp. 93–122). Springer International Publishing. https://doi.org/10.1007/978-3-319-44383-6_5

Creswell, J. W. (2014). *Research Design: qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publications.

Dewi, C. A., Khery, Y., & Erna, M. (2019). An ethnoscience study in chemistry learning to develop scientific literacy. *Jurnal Pendidikan IPA Indonesia*, *8*(2), 279–287. https://doi.org/10.15294/jpii.v8i2.19261

Eko, P. S., Eko, H., Munandar, M. A., & Rachmand, M. (2020). Local wisdom: Pillar development of multicultural nations and national education values. *Cypriot Journal of Educational Sciences*, *15*(6), 1587–1598. https://doi.org/10.18844/CJES.V15I6.5319

García-Carmona, A. (2023). Scientific Thinking and Critical Thinking in Science Education : Two Distinct but Symbiotically Related Intellectual Processes. *Science and Education*. https://doi.org/10.1007/s11191-023-00460-5

Goorney, S., Foti, C., Santi, L., Sherson, J., Yago Malo, J., & Chiofalo, M. L. (2022). Culturo-Scientific Storytelling. *Education Sciences*, *12*(7). https://doi.org/10.3390/educsci12070474

Gürsoy, G. (2021). Digital storytelling: Developing 21st century skills in science education. In *European Journal of Educational Research* (Vol. 10, Issue 1, pp. 97–113). Eurasian Society of Educational Research. https://doi.org/10.12973/EU-JER.10.1.97

Hubber, P., & Ramseger, J. (2016). Physical learning environments for science education: An ethnographic field study of primary classrooms in Australia, Germany and Taiwan. In *Quality Teaching in Primary Science Education: Cross-cultural Perspectives* (pp. 51–77). Springer International Publishing. https://doi.org/10.1007/978-3-319-44383-6_3

Kristanto, A. (2019). Promoting Local Wisdom in International Primary Curriculum Aims to Develop Learners' Problem Solving Skills. *International Journal of Educational Research Review*. https://orcid.org/0000-0002-4703-9768

Kromka, S. M., Goodboy, A. K., & Banks, J. (2020). Teaching with relevant (and irrelevant) storytelling in the college classroom. *Communication Education*, *69*(2), 224–249. https://doi.org/10.1080/03634523.2019.1657156

OECD. (2019). *PISA 2018 Assessment and Analytical Framework* (OECD, Ed.). OECD Publishing. https://doi.org/10.1787/b25efab8-en

Ramdani, A., Jufri, A. W., Gunawan, Fahrurrozi, M., & Yustiqvar, M. (2021). Analysis of students' critical thinking skills in terms of gender using science teaching materials based on the 5e learning cycle integrated with local wisdom. *Jurnal Pendidikan IPA Indonesia*, *10*(2), 187–199. https://doi.org/10.15294/jpii.v10i2.29956

Saefullah, A., Samanhudi, U., Nulhakim, L., Berlian, L., Rakhmawan, A., Rohimah, B., Zaky, R. A., & Islami, E. (2017). Efforts to Improve Scientific Literacy of Students through Guided Inquiry Learning Based on Local Wisdom of Baduy"s Society. *Jurnal Penelitian Dan Pembelajaran IPA*, *3*(2), 84–91.

Saritepeci, M. (2021). Students' and Parents' Opinions on the Use of Digital Storytelling in Science Education. *Technology, Knowledge and Learning*, *26*(1), 193–213. https://doi.org/10.1007/s10758-020-09440-y

Sumarni, W., & Kadarwati, S. (2020). Ethno-stem project-based learning: Its impact to critical and creative thinking skills. *Jurnal Pendidikan IPA Indonesia*, *9*(1), 11–21. https://doi.org/10.15294/jpii.v9i1.21754

Wilujeng, I., Zuhdan, K. P., & Suryadarma, I. G. P. (2019). Integrating Local Wisdom in Natural Science Learning. *1st International Conference on Innovation in Education (ICoIE 2018)*, 182–186.

Wu, P. H., Kuo, C. Y., Wu, H. K., Jen, T. H., & Hsu, Y. S. (2018). Learning benefits of secondary school students' inquiry-related curiosity: A cross-grade comparison of the relationships among learning experiences, curiosity, engagement, and inquiry abilities. *Science Education*, *102*(5), 917–950. https://doi.org/10.1002/sce.21456

Xudong, Z., & Li, J. (2020). Investigating 'collective individualism model of learning': From Chinese context of classroom culture. *Educational Philosophy and Theory*, *52*(3), 270–283. https://doi.org/10.1080/00131857.2019.1638762

Yacoubian, H. A. (2018). Scientific literacy for democratic decision-making. *International Journal of Science Education*, *40*(3), 308–327. https://doi.org/10.1080/09500693.2017.1420266

Yerrick, R., & Ridgeway, M. (2017). Culturally responsive pedagogy, science literacy, and urban underrepresented science students. *International Perspectives on Inclusive Education*, *11*, 87–103. https://doi.org/10.1108/S1479-363620170000011007