

ORIGINAL

From Local Wisdom to Digital Learning: Ethnographic Exploration of Bugis Mappacci and Its Potential in Augmented Reality Biology Education

De la sabiduría local al aprendizaje digital: exploración etnográfica de Bugis Mappacci y su potencial en la educación biológica de realidad aumentada

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Cite as: Nur Veryani A, Asmawati Azis A, Bin Jamaluddin A, Daud F. From Local Wisdom to Digital Learning: Ethnographic Exploration of Bugis Mappacci and Its Potential in Augmented Reality Biology Education. Salud, Ciencia y Tecnología. 2025; 5:2333. <https://doi.org/10.56294/saludcyt20252333>

Submitted: 21-04-2025

Revised: 10-07-2025

Accepted: 15-10-2025

Published: 16-10-2025

Editor: Prof. Dr. William Castillo-González 

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ABSTRACT

Introduction: Augmented Reality (AR) has been widely applied in science learning, its potential to integrate local wisdom into biology education remains underexplored. In the Bugis culture of South Sulawesi, the Mappacci ritual embodies values of purity, togetherness, parental respect, and readiness for a new life.

Method: this study employed a qualitative descriptive design with an ethnographic approach. Fieldwork was conducted in Bone Regency, South Sulawesi, involving traditional leaders, community figures, and biology education students as preservice teachers. Data were collected through participatory observation, in-depth interviews, documentation, and open-ended questionnaires. Data analysis followed the Miles, Huberman, and Saldaña model, with triangulation of sources and techniques to ensure validity

Results: findings revealed that the Mappacci ritual is not merely a pre-wedding tradition but a medium of internalizing moral and social values. Symbols such as henna leaves, rice, jackfruit leaves, and candles were interpreted as cultural representations with educational relevance, particularly in plant ecology and life cycle topics. Preservice biology teachers expressed positive perceptions of integrating these values into AR-based learning, emphasizing its potential to create interactive, contextual, and culturally grounded experiences that strengthen scientific literacy and cultural identity

Conclusions: this research highlights the potential of combining ethnographic exploration and digital technology to enrich biology education. Embedding Bugis local wisdom into AR-based media provides a holistic learning model that enhances cognitive understanding while fostering cultural awareness and character development

Keywords: Local Wisdom; Bugis Culture; Mappacci Ritual; Augmented Reality; Biology Education.

RESUMEN

Introducción: aunque la Realidad Aumentada (RA) se ha aplicado ampliamente en el aprendizaje de las ciencias, su potencial para integrar la sabiduría local en la educación biológica sigue siendo poco explorado. En la cultura bugis de Sulawesi del Sur, el ritual Mappacci encarna valores de pureza, colectividad, respeto a los padres y preparación para una nueva vida.

Método: este estudio utilizó un diseño cualitativo descriptivo con enfoque etnográfico. El trabajo de campo se realizó en la regencia de Bone, Sulawesi del Sur, con líderes tradicionales, figuras comunitarias y estudiantes de educación biológica como futuros docentes. Los datos se recopilaban mediante observación participativa, entrevistas en profundidad, documentación y cuestionarios abiertos. El análisis de datos siguió el modelo de

Miles, Huberman y Saldaña, con triangulación de fuentes y técnicas para garantizar la validez.

Resultados: los hallazgos mostraron que el ritual Mappacci no es solo una tradición previa al matrimonio, sino un medio para interiorizar valores morales y sociales. Símbolos como las hojas de pacar, el arroz, las hojas de yaca y las velas se interpretaron como representaciones culturales con relevancia educativa, especialmente en temas de ecología vegetal y ciclos de vida. Los futuros docentes de biología expresaron percepciones positivas sobre la integración de estos valores en el aprendizaje basado en RA, destacando su potencial para crear experiencias interactivas, contextuales y culturalmente enraizadas que fortalezcan la alfabetización científica y la identidad cultural

Conclusiones: esta investigación resalta el potencial de combinar la exploración etnográfica y la tecnología digital para enriquecer la educación biológica. Incorporar la sabiduría local bugis en medios basados en RA proporciona un modelo de aprendizaje holístico que mejora la comprensión cognitiva y fomenta la conciencia cultural y el desarrollo del carácter

Palabras clave: Sabiduría Local; Cultura Bugis; Ritual Mappacci; Realidad Aumentada; Educación Biológica.

INTRODUCTION

The demands of 21st-century education require learning systems worldwide to integrate scientific, technological, character, and cultural literacy in order to equip students with the competencies necessary to face global challenges.⁽¹⁾ The rapid advancement of digital technologies offers new opportunities for education, particularly through the use of Augmented Reality (AR), which can present biological content in a more interactive, contextual, and visual manner.^(2,3) Conversely, the intensifying currents of globalization have led students to become more familiar with universal knowledge than with local cultural values, which are in fact essential for strengthening national identity.⁽⁴⁾ This condition highlights the necessity for education systems to bridge modern technologies with local wisdom, ensuring that learning processes are not only oriented toward global competencies but also firmly rooted in the cultural heritage of local communities.

Local wisdom in education plays a crucial role in preserving cultural identity while simultaneously instilling moral values and character in students.^(5,6) In Indonesia, local wisdom is understood as a body of knowledge, values, and practices inherited across generations, which regulate human relationships with one another and with the natural environment. Within the context of Bugis culture, these values are embodied in the *pangadereng* system, one of which is manifested through the *Mappacci* ritual that is rich in religious, moral, and social significance.⁽⁷⁾ The integration of local wisdom, such as *Mappacci* into biology education not only supports students in understanding science in a contextual manner but also fosters attitudes of care, cooperation, and respect for ancestral traditions.

Most studies on *pangadereng* and the *Mappacci* ritual in Bugis society have primarily focused on descriptive or anthropological aspects, thereby emphasizing only philosophical and normative values.⁽⁸⁾ This condition has limited the development of *Mappacci*'s cultural values into biology education in an applied manner, particularly with modern technology-based media. Moreover, studies specifically examining the perceptions of preservice biology teachers regarding the potential integration of *Mappacci* values into Augmented Reality are scarcely found in the literature. This gap indicates an urgent need for research that combines ethnographic exploration with an analysis of preservice teachers' perceptions as the basis for developing innovative biology learning that is contextual, interactive, and rooted in local wisdom.^(9,10)

The objective of this study is to explore and describe the values embedded in the *Mappacci* ritual of Bugis culture through an ethnographic approach, with an emphasis on its meanings, symbols, and relevance to education, particularly in the context of biology learning. The study further aims to analyze the perceptions of preservice biology teachers regarding the potential integration of *Mappacci* values into Augmented Reality-based instructional media. By combining cultural exploration with an examination of preservice teachers' perspectives, this research is expected to contribute to the development of biology learning strategies that are more contextual, interactive, and grounded in local wisdom.

METHOD

This study employed a two-phase sequential design within a descriptive qualitative approach. Phase 1 (Ethnography) explored the cultural values embedded in the Bugis *Mappacci* ritual, while Phase 2 (Perception Study) examined the perspectives of preservice biology teachers regarding the applicability of these values in Augmented Reality (AR)-based biology instruction.

In Phase 1, participants were selected using Purposive Sampling to ensure the inclusion of individuals with recognized expertise in Bugis culture. This group consisted of eight traditional leaders (all male, aged 50-70) and three community figures (two male, one female, aged 40-60) from Bone Regency, South Sulawesi, Indonesia.

In Phase 2, preservice biology teachers were recruited using Criterion Sampling, with the inclusion criterion that participants had completed the course “Plant Ecology and Instructional Media”. The sample comprised 20 students (12 female, 8 male), aged 19-22, representing the second- and third-year cohorts of the Biology Education Program at Universitas Negeri Makassar.

In Phase 1, data were collected through three months of participatory observation during the *Mappacci* ritual, semi-structured interviews with traditional leaders and community figures (45-60 minutes per session). In Phase 2, data were obtained through open-ended questionnaires and semi-structured interviews with preservice teachers to explore their perceptions of integrating *Mappacci* values into AR-based biology learning.

This study received ethical clearance from the Institutional Review Board (IRB) of Universitas Negeri Makassar. Before data collection, all participants were fully informed about the study’s objectives, procedures, and confidentiality measures. Written informed consent was obtained from every participant, and pseudonyms were employed to ensure anonymity.

RESULTS

Values of the Mappacci Ritual in Bugis Culture

The ethnographic exploration revealed that the *Mappacci* ritual is not merely understood as a customary pre-wedding ceremony, but rather as a means of internalizing noble values within Bugis society. The core meanings identified include purity, togetherness, parental blessings, respect for elders, and readiness to enter a new stage of life. The ritual is carried out through sequential stages, beginning with *Mappanre Temme’* (Qur’an recitation completion), followed by *Barzanji* chanting, and culminating in *Mappaccing* (the application of henna leaves to the palms of the bride and groom) (figure 1). One participant emphasized:

“The true meaning is to cleanse the heart of the bride and groom so they are ready to begin a new life.”

Each stage embodies character education values such as discipline, role modeling, solidarity, and submission to God. Furthermore, the ritual items used such as henna leaves, jackfruit leaves, candles, rice, and silk cloth carry philosophical meanings that can be transformed into the context of biology education, particularly in topics such as plant ecology, the symbolism of life, and concepts of sustainability.

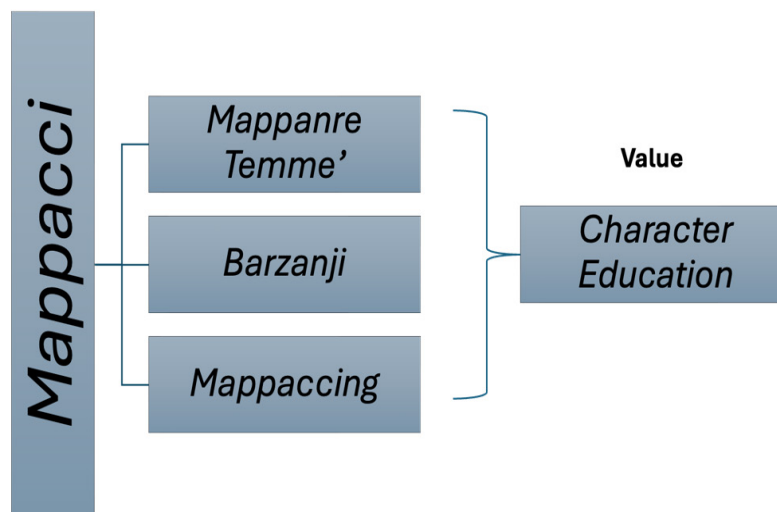


Figure 1. The Value of *Mappacci* Ritual

Preservice Biology Teachers’ Perceptions of the Potential Integration of Mappacci into AR

Based on interviews and open-ended questionnaires, preservice biology teachers expressed positive perceptions toward the use of the *Mappacci* ritual in Augmented Reality (AR)-based learning media. They emphasized that AR could effectively visualize the ritual stages, cultural symbols, and philosophical meanings of *Mappacci* in a more engaging way, making them easier for students to understand (figure 2). AR was perceived as capable of providing an interactive, contextual, and culturally grounded learning experience, thereby bridging modern scientific knowledge with traditional values. One participant noted:

“I believe AR can serve as a bridge between culture and science. Students can virtually experience the Mappacci ritual and then connect it with character values and biological concepts.”

In addition, preservice teachers argued that such integration has the potential to strengthen students’ cultural identity, enhance scientific literacy, and foster the development of character education relevant to the demands of the 21st century. However, some also highlighted the need for adequate training and guidance to ensure that AR technology can be optimally implemented in biology learning practices.

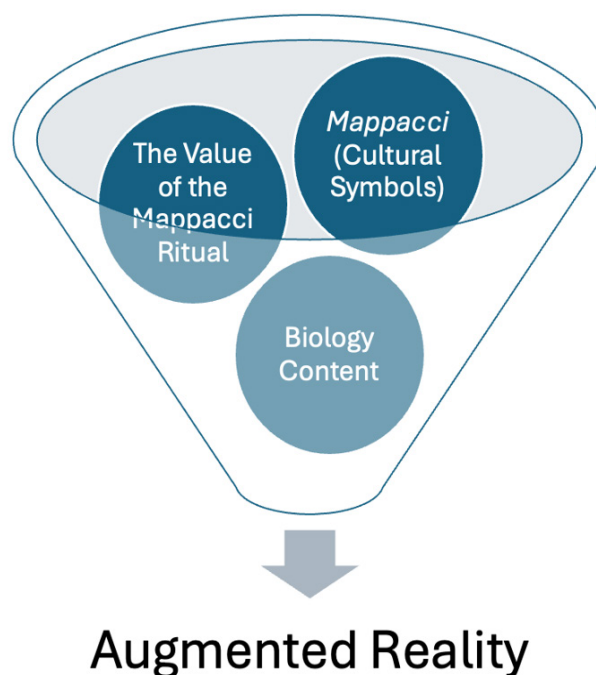


Figure 2. The Potential of Integrating *Mappacci* into AR Media

DISCUSSION

The *Mappacci* ritual in Bugis society demonstrates that cultural traditions are not only imbued with religious and social meaning but can also serve as a foundation for more contextual biology learning.⁽⁷⁾ Symbols such as henna leaves, jackfruit leaves, rice, and candles represent biological concepts.^(7,8) The integration of these values aligns with the concept of ethnopedagogy, namely the utilization of local wisdom in educational processes to cultivate character while simultaneously strengthening scientific literacy. This is consistent with previous studies showing that culture-based learning can enhance students' environmental awareness, empathy, and collaboration.⁽¹¹⁾

The findings of this study reinforce previous research on the significance of local wisdom in education⁽¹²⁾, while simultaneously extending the discourse by demonstrating that the symbolic elements of the *Mappacci* ritual function not only as cultural heritage but also as contextualized media for biology learning through Augmented Reality. These results reaffirm the relevance of the ethnopedagogical approach widely discussed in the literature, yet differ from prior studies by introducing digital innovation as a tangible bridge between tradition and modern science. This research not only confirms the educational value of cultural traditions but also challenges perspectives that frame them merely as objects of preservation, thereby expanding the theoretical framework of ethnopedagogy into a technology-enhanced ethnopedagogy.

Preservice biology teachers' perceptions of the potential integration of the *Mappacci* ritual into AR indicated a positive orientation, as this technology is perceived to bridge culture and modern science. Preservice teachers emphasized that AR can visualize the stages of the *Mappacci* ritual in a more engaging, interactive, and comprehensible way, thereby making biology learning less abstract.^(13,14) These findings reinforce the notion that digital innovation can serve as an effective medium for bringing local cultural values into the classroom while simultaneously increasing students' motivation to learn.⁽¹⁵⁾ Moreover, the positive responses of preservice teachers reflect the readiness of a new generation of educators to adopt technology-based pedagogical approaches rooted in local wisdom.

The combination of ethnographic exploration of *Mappacci* values and preservice teachers' perceptions indicates that integrating local wisdom with digital technology has strong potential to enrich biology education. Theoretically, this supports the paradigm of 21st-century learning, which emphasizes literacy in science, technology, character, and culture.⁽¹⁶⁾ Practically, the findings of this study can serve as a foundation for developing AR-based media grounded in *Mappacci* values, which not only enhance students' understanding of biological concepts but also strengthen their cultural identity and character values. Thus, this research contributes to advancing biology education that is innovative, contextual, and inclusive.^(17,18)

This study has several limitations that warrant acknowledgment. The participants were limited to traditional leaders and preservice biology teachers from a single region (Bone Regency) and one educational institution, which restricts the generalizability of the findings. Moreover, the study primarily focused on teachers'

perceptions, leaving the actual effectiveness of AR media that integrates *Mappacci* values in real classroom practice yet to be tested. The theoretical contribution of the study becomes clearer in enriching the concept of ethnopedagogy, while its practical pathway opens opportunities for developing innovative instructional media that embed cultural values while simultaneously enhancing 21st-century scientific literacy.

CONCLUSIONS

The main stages of the *Mappacci* ritual, namely *Mappanre Temme'*, *Barzanji*, and *Mappacking* encompass essential values such as purity, prayer, respect, togetherness, and steadfastness. These values can be integrated into character education, positioning the *Mappacci* tradition not merely as a customary ceremony but also as a medium for moral, spiritual, and social formation of students. The values of *Mappacci*, its cultural symbols (henna leaves, rice, candles, jackfruit leaves), and the meanings embedded in the ritual can be combined with biology content through an ethnopedagogical approach. This integration underscores that Bugis local wisdom can serve as a relevant, contextual, and meaningful learning resource to strengthen scientific understanding. The fusion of ritual values, cultural symbols, and biological content can produce a holistic learning model. When visualized through Augmented Reality, such integration not only enriches cognitive aspects but also supports the cultivation of character and the strengthening of students' cultural identity within biology education.

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FINANCING

This research was financially supported by the Directorate of Research and Community Service, Ministry of Higher Education, Science, and Technology of Indonesia, under contract numbers 084/C3/DT.05.00/PL/2025 and 2877/UN36.11/TU/2025.

CONFLICT OF INTEREST

There is no conflict of interest.

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