



Development of Tri Hita Karana-Oriented Augmented Reality Learning Media to Enhance Kindergarten Children's Creativity Through Ogoh-Ogoh Culture

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Abstract: This study aims to develop and evaluate an augmented reality (AR) learning medium that integrates Tri Hita Karana principles with Ogoh-Ogoh cultural content to foster creativity and cultural awareness among kindergarten children. The study employed a Research and Development (R&D) approach based on the ADDIE framework, comprising five stages: analysis, design, development, implementation, and evaluation. Thirty children aged 5–6 years from Taman Kanak-Kanak Widya Nugraha participated in the study. The effectiveness of the AR learning medium was evaluated using a one-group pretest–posttest design. Data were collected through expert validation, classroom observations, creativity assessment rubrics, and participant response questionnaires. Expert validation yielded a mean Aiken's V coefficient of 0.91, indicating strong content validity across the evaluated dimensions, including content, interface, interactivity, and cultural integration. The mean creativity score increased from 61.33 before the intervention to 84.67 after the intervention, yielding an N-gain score of 0.61. A paired-samples t-test also revealed a statistically significant difference between the pretest and posttest scores ($p < .05$). During AR-supported activities, the children engaged in three-dimensional cultural exploration and storytelling that encouraged imagination, originality, artistic expression, and active participation. The integration of Ogoh-Ogoh representations and Tri Hita Karana principles also connected the learning activities with Balinese cultural contexts. These findings suggest that the developed AR learning medium is valid and has the potential to support creativity-oriented and culturally contextualized learning in early childhood education.

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Introduction

The development of technology-based learning media has become increasingly important in early childhood education to support creativity, engagement, and contextual learning. Kindergarten children benefit from interactive and visual approaches involving concrete objects, play activities, and culturally relevant experiences. However, conventional learning practices dominated by verbal explanations and printed materials may limit children's opportunities to explore, imagine, and express creativity. In Bali, the Ogoh-Ogoh tradition represents cultural heritage containing artistic, social, and spiritual values relevant to children's creativity and character development. Tri Hita Karana, which emphasizes harmony among humans, nature, and spirituality, also provides a philosophical foundation for contextual and character oriented learning (Pramerta, 2023; Indrawan & Parmithi, 2022; Irfansyah, 2023). Meanwhile, Augmented Reality (AR) enables cultural objects to be presented through interactive three-dimensional visualizations that can stimulate children's



attention and imagination. Previous studies have demonstrated that AR-based learning can enhance motivation, creativity, and active participation through integrated visual, auditory, and interactive experiences (Bramayudha et al., 2025; Suwastina & Yudiana, 2024; Novaliendry, 2022). Therefore, integrating AR technology with local wisdom offers a promising approach to creating culturally meaningful learning experiences while strengthening children's creativity, cultural awareness, and contextual understanding (Criollo-C et al., 2024; Hidajat, 2024).

Creativity development in early childhood education is an essential foundation for supporting children's cognitive, social, emotional, and artistic growth in the digital era. Kindergarten learning should provide meaningful experiences that encourage imagination, exploration, and active participation through culturally relevant activities and interactive media. However, learning practices in many early childhood institutions still emphasize conventional instruction and worksheet-based activities, which often restrict children's opportunities to develop creative thinking and self-expression. The integration of local culture into learning activities is considered important because it helps children recognize cultural identity while simultaneously strengthening character education from an early age. In Bali, the Ogoh-Ogoh tradition contains artistic, collaborative, and spiritual values that are highly relevant for stimulating children's creativity and cultural awareness. Nevertheless, the utilization of Ogoh-Ogoh culture as a technology-based learning medium remains limited, especially in kindergarten education. Augmented Reality (AR) technology offers significant potential to create immersive and interactive learning experiences by presenting three-dimensional visualizations capable of increasing children's curiosity, engagement, and creative exploration. Moreover, the Tri Hita Karana philosophy provides a contextual learning framework emphasizing harmony between humans, nature, and spirituality, making learning activities more meaningful and value oriented. Previous studies revealed that AR-based media integrated with local wisdom can improve creativity, motivation, and active learning participation among young learners (Artikel & Info, 2022; Koumpouros, 2024; Zhang et al., 2022). Additionally, culture-based learning approaches have been shown to strengthen children's creativity and cultural appreciation in early childhood education environments (Alkhasawneh et al., 2024; Bagus et al., 2025; Komang et al., 2024).

The rapid advancement of digital technology has created opportunities to develop innovative learning media that support creativity and cultural understanding in early childhood education. Augmented Reality (AR) is particularly relevant because it integrates interactive three-dimensional objects into real world environments, providing kindergarten children with concrete visualization, interactive exploration, and multisensory learning experiences appropriate to their developmental characteristics. Previous studies have shown that AR-based learning can enhance children's attention, imagination, motivation, and creative engagement by enabling active interaction with digital objects (Algerafi et al., 2023; Kelpsiene & Monkeviciene, 2024; Presser et al., 2025). However, existing AR applications in early childhood education predominantly emphasize cognitive outcomes and digital visualization, while the integration of local cultural values and character education remains limited (Leinonen et al., 2021; Sahara & Dewi, 2025). This limitation highlights the need for culturally contextualized AR learning that connects technological innovation with children's socio-cultural environments. In Bali, the Ogoh-Ogoh tradition provides artistic, collaborative, and spiritual elements that can stimulate creativity, while Tri Hita Karana offers a philosophical framework emphasizing harmony among humans, nature, and spirituality. Therefore, integrating AR, Ogoh-Ogoh culture, and Tri Hita Karana provides a contextual,



interactive, and culturally meaningful approach to fostering creativity and cultural awareness among kindergarten children (Alali, 2024; Wang, 2022).

Existing research has demonstrated the potential of Augmented Reality (AR) for delivering culturally contextualized learning experiences, including the digital representation of Balinese heritage. Through interactive three-dimensional environments, AR enables traditional objects, ceremonial practices, and artistic expressions to be explored in ways that can encourage children's engagement with local culture (Indrawan et al., 2025; Wulandari et al., 2025). Nevertheless, earlier applications have largely concentrated on exposing learners to cultural content and providing interactive digital experiences, while the development of creativity within structured kindergarten learning has received less attention. Another gap concerns the incorporation of Tri Hita Karana into AR-supported educational activities. This philosophical framework is particularly relevant to the Balinese context because it provides cultural values that can inform character oriented and contextual learning. In addition, limited attention has been given to examining how AR activities influence children's creative expression and active involvement in the learning process. These gaps highlight the importance of developing an AR learning medium that connects Ogoh-Ogoh cultural content with Tri Hita Karana principles while providing opportunities for kindergarten children to explore, participate, and express creative ideas (Rahmawati & Riyanto, 2023; Raihan et al., 2021; Santika, 2022).

The novelty of this study lies in the purposeful integration of Augmented Reality (AR) technology, Ogoh-Ogoh culture, and the Tri Hita Karana philosophy within a unified learning medium designed to enhance kindergarten children's creativity. This integration is important because AR provides interactive and immersive three-dimensional experiences that support children's exploration and imagination, while Ogoh-Ogoh offers a culturally familiar context through which children can engage with Balinese artistic traditions. Tri Hita Karana further provides a value-based framework emphasizing harmony among humans, nature, and spirituality, enabling the learning experience to incorporate cultural and character values alongside creative development. Previous AR-based studies have predominantly focused on digital visualization, cultural introduction, or cognitive learning outcomes, with limited attention to the simultaneous integration of immersive technology, local cultural content, philosophical values, and creativity development in kindergarten education. Therefore, this study aims to develop and evaluate Tri Hita Karana-oriented AR media integrated with Ogoh-Ogoh culture for enhancing kindergarten children's creativity and cultural awareness. The study contributes to early childhood education by providing a culturally contextualized AR learning model that connects technological innovation with local wisdom and creativity-oriented learning, while also offering an alternative approach to preserving and introducing Balinese cultural values to young children through meaningful digital learning experiences.

Research Method

The development and evaluation of the learning media followed a Research and Development (R&D) framework based on the ADDIE model, which includes analysis, design, development, implementation, and evaluation (Branch, 2009). The participants comprised 30 children aged 5–6 years from Widya Nugraha Kindergarten who were recruited purposively according to predetermined criteria related to age, enrollment status, and involvement in the learning activities. Initial analysis was carried out through classroom observation, interviews with teachers, and curriculum examination to determine instructional needs and identify gaps in culturally contextualized digital resources. The subsequent design



process focused on preparing storyboards, interface layouts, AR markers, interaction scenarios, and activities intended to foster creativity. The application was then constructed with Unity and Vuforia by embedding three-dimensional Ogoh-Ogoh objects, animation, narration, and content reflecting Tri Hita Karana principles. Its validity was examined through expert judgment using Aiken's V. Classroom implementation adopted a one-group pretest–posttest design to examine changes in creativity alongside engagement and usability. Product evaluation addressed validity, practicality, and effectiveness. Quantitative evidence was processed using descriptive statistics, a paired-samples t test for pretest posttest differences, and normalized gain (N-gain) to quantify the magnitude of improvement in children's creativity.

Data collection in this study employed expert validation sheets, observation instruments, creativity assessment rubrics, and teacher and student response questionnaires to comprehensively evaluate the feasibility, practicality, and effectiveness of the developed Tri Hita Karana-oriented Augmented Reality (AR) media. Expert validation involved three validators, comprising one expert in early childhood education, one expert in educational media, and one expert in Balinese culture. The validators assessed the media in terms of content accuracy, interface design, interactivity, and cultural integration. Children's creativity was measured using observation sheets and performance-based rubrics covering imagination, originality, artistic expression, and participation before and after the learning intervention. Teacher and student response questionnaires using a Likert scale were administered to assess usability, attractiveness, and learning practicality. The effectiveness of the AR media was evaluated using a One Group Pretest Posttest Design. Prior to hypothesis testing, a normality test was conducted to verify the assumptions required for parametric analysis. Differences between pretest and posttest creativity scores were analyzed using a Paired Samples t-test, while Normalized Gain (N-gain) analysis was employed to determine the magnitude of improvement in children's creativity following the Ogoh-Ogoh culture-based AR learning intervention.

Results and Discussion

The implementation of Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture demonstrated its potential to create an interactive, culturally contextualized learning environment for kindergarten children. Classroom observations indicated that children actively engaged with the AR activities and showed greater involvement in exploring, expressing, and developing creative ideas. The interactive representation of Ogoh-Ogoh culture provided opportunities for children to connect digital exploration with culturally familiar experiences, while the incorporation of Tri Hita Karana values introduced the principles of harmony among humans, nature, and spirituality within the learning process. Children's responses during the activities also indicated development in key dimensions of creativity, particularly imagination, originality, artistic expression, and idea exploration. Teachers observed increased attention, motivation, and participation, suggesting that the combination of immersive technology and culturally relevant content supported sustained engagement during learning activities. These findings indicate that the educational value of the developed media extends beyond its technological features by providing a culturally meaningful environment in which children can actively construct and express creative ideas. This pattern is consistent with previous research showing that AR-supported learning can promote creativity, engagement, and interactive learning among young children (Rahman & Hidayati, 2023; Yuliana et al., 2024). The findings also support

evidence that incorporating local wisdom into digital learning can strengthen contextual learning and early cultural awareness (Pramana & Dewi, 2025; Aryawan et al., 2024).



Figure 1. Introducing Balinese Ogoh-Ogoh Culture Through Tri Hita Karana-Oriented Augmented Reality Learning



Figure 2. Tri Hita Karana-Oriented AR Interaction for Introducing Ogoh-Ogoh Culture in Kindergarten Learning

Figure 1 and 3 illustrate the introductory scene and interactive interface of the Tri Hita Karana-oriented Augmented Reality (AR) learning media integrated with Ogoh-Ogoh culture for kindergarten children. The first image presents a welcoming situation at Bali International Airport, where children are introduced to Balinese cultural identity through visual storytelling, traditional architecture, and local characters. Meanwhile, the second image shows the AR interaction process in which three-dimensional cultural objects appear through smartphone-based visualization accompanied by dialogue narration. The interface design emphasizes colorful visuals, simple navigation, and child-friendly interaction to support creativity, imagination, and cultural understanding. Furthermore, the integration of local wisdom and immersive AR technology creates contextual learning experiences that encourage active participation and meaningful exploration among kindergarten children.



Figure 3. Interactive Visualization of Ogoh-Ogoh Cultural Parade Through Tri Hita Karana-Oriented AR Learning Media



Figure 4. Three-Dimensional Ogoh-Ogoh Visualization in Tri Hita Karana-Oriented AR Learning Media

Figure 3 and 4 illustrate the implementation of Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture in kindergarten learning activities. The first image presents the AR visualization process in which three-dimensional Ogoh-Ogoh objects appear interactively through smartphone-based technology, allowing children to observe cultural elements in a more concrete and immersive manner. Meanwhile, the second image depicts a cultural parade atmosphere featuring Ogoh-Ogoh performances, traditional music, and community participation that introduce Balinese local wisdom contextually. The combination of AR visualization and cultural storytelling creates engaging learning experiences that stimulate children’s imagination, creativity, cultural awareness, and active participation through interactive and meaningful exploration activities.

Table 1. Expert Validation Results of AR Media

Validation Aspect	Aiken’s V Score	Category
Content Feasibility	0.91	Very Valid
Media Design	0.89	Very Valid
Cultural Integration	0.93	Very Valid
Interactivity	0.9	Very Valid
Interface Usability	0.92	Very Valid
Average Score	0.91	Very Valid

Expert validation confirmed that the developed Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture demonstrated strong feasibility across content, media design, cultural integration, interactivity, and interface usability, with all Aiken’s V coefficients exceeding 0.80 and an overall average of 0.91. Cultural integration received the strongest validation, indicating that the media appropriately incorporated Balinese cultural values into kindergarten learning. Furthermore, the implementation findings demonstrated a significant improvement in children’s creativity following the AR-based learning intervention. The mean creativity score increased from 61.33 on the pretest to 84.67 on the posttest, while the Paired Samples t-test confirmed that the difference was statistically significant ($p < 0.05$). Observations also indicated improvements in imagination, originality, artistic expression, participation, confidence in expressing ideas, and peer interaction. Overall, these findings demonstrate that combining immersive AR visualization with culturally contextualized learning provides a feasible and effective approach to supporting creativity and meaningful learning experiences among kindergarten children.

Table 2. Pretest and Posttest Creativity Results

Assessment	Mean Score	Category
Pretest	61.33	Moderate
Posttest	84.67	High



Gain Score 0.61 Moderate-High

The results indicate a meaningful improvement in children's creativity following the AR-based learning intervention. The increase from pretest to posttest, supported by the N-gain analysis and statistical significance test, suggests that the developed media contributed positively to creativity development, particularly in imagination, originality, artistic expression, and active participation.

Table 3. Practicality and User Response Results

Assessment Aspect	Percentage	Category
Ease of Use	92.10%	Very Practical
Visual Attractiveness	93.40%	Very Practical
Interactivity	90.70%	Very Practical
Learning Motivation	91.80%	Very Practical
Overall Average	91.40%	Very Practical

The practicality findings indicate that the developed AR media was well accepted by both teachers and children and was suitable for classroom implementation. The consistently positive evaluations across usability, visual attractiveness, interactivity, and learning motivation suggest that the media provided an accessible and engaging learning experience for kindergarten children. Teachers' responses further indicated that the simple navigation and interactive features facilitated classroom use, while children's engagement with the AR activities reflected the media's ability to sustain attention and encourage active participation. These findings suggest that integrating child-friendly AR features with culturally relevant Ogoh-Ogoh content can support practical implementation without compromising the accessibility of the learning activities. More importantly, the high level of practicality indicates that the developed media has potential for integration into early childhood learning as a supplementary resource for promoting creativity and cultural awareness.

The findings indicate that Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture supports kindergarten children's creativity, engagement, and cultural understanding. From the Cognitive Theory of Multimedia Learning (CTML) perspective, combining three-dimensional objects, animation, narration, and cultural storytelling supports information processing and the construction of creative ideas (Rati et al., 2025; Raharja et al., 2022). Ogoh-Ogoh provides culturally familiar artistic stimuli through distinctive forms, colors, ornaments, and symbolic representations. AR-based exploration allows children to observe, manipulate, and reinterpret these cultural forms, potentially stimulating originality by encouraging ideas beyond direct imitation. Its artistic characteristics also provide concrete references for experimenting with shapes, colors, and visual details, supporting artistic expression. Meanwhile, Tri Hita Karana introduces values of harmony among humans, nature, and spirituality, broadening children's creative ideas through social, environmental, and cultural-spiritual contexts. Consistent with Constructivist learning theory, these culturally relevant experiences enable children to construct meaning through active exploration and interaction. Thus, integrating Ogoh-Ogoh, Tri Hita Karana, and interactive AR provides meaningful contexts for developing imagination, originality, artistic expression, and cultural awareness. Future studies should employ larger samples, comparison groups, and longitudinal designs to examine sustained effects on creativity and character development.



Conclusion

The results of this study indicate that the development of Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture has significant potential to enhance kindergarten children's creativity and cultural understanding through interactive and contextual learning experiences. The expert validation results demonstrate that the developed media achieved a very high level of feasibility, with an average Aiken's V score of 0.91, indicating strong agreement among experts regarding content relevance, media design, interactivity, and cultural integration. Furthermore, the implementation results reveal that the AR media effectively improved children's creativity, as reflected in the increase between pretest and posttest scores and supported by a moderate-high N-gain score of 0.61. The use of three-dimensional visualization, animation, audio narration, and interactive storytelling successfully stimulated children's imagination, originality, artistic expression, and active participation during learning activities. In addition, integrating Ogoh-Ogoh culture and Tri Hita Karana values into the AR media created meaningful learning experiences closely related to children's social and cultural environments in Bali. This contextual approach not only enhanced creativity development but also strengthened cultural awareness and appreciation of local wisdom from an early age. Moreover, the positive responses from teachers and children indicate that the developed AR media is highly practical, attractive, and suitable for early childhood education environments.

Recommendation

Based on the findings of this study, the implementation of Tri Hita Karana-oriented Augmented Reality (AR) media integrated with Ogoh-Ogoh culture should consider the technological, pedagogical, and cultural challenges associated with culturally based digital learning. Teachers should receive practical training in operating AR applications and facilitating creative activities so that technology supports meaningful cultural exploration rather than passive digital interaction. Schools should ensure adequate access to compatible devices, stable technical support, and classroom management strategies appropriate for young children. Particular attention should be given to cultural authenticity, as the digital representation of Ogoh-Ogoh and Tri Hita Karana values should accurately reflect their artistic, philosophical, and spiritual meanings. Therefore, collaboration among teachers, AR developers, early childhood education specialists, and Balinese cultural experts is recommended during content development and evaluation to prevent cultural oversimplification or misrepresentation. AR content should also be developmentally appropriate, visually accessible, and periodically reviewed to maintain its cultural and educational relevance. Future research should involve larger and more diverse samples, comparison groups, and longer implementation periods to examine the sustainability of creativity development, cultural awareness, and character related outcomes across different early childhood education settings.

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