International Conference on Innovation, Reflection, and Creativity in Arts, Literature, and Language Education (I-CIRCALLED)
Fakultas Bahasa dan Seni, Universitas Negeri Jakarta
14 Oktober 2025

Equity and Access in AR-Enabled Arts Education: A Literature Review with Implications for Indonesian Junior High Schools

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Keywords: augmented reality, arts education, cultural literacy, equity, access

Abstract
This literature review explores issues of equity and access in using augmented reality (AR) for arts education, especially in junior high school dance learning. Studies show that AR can enhance engagement, creativity, and cultural literacy, but challenges such as unequal device ownership, unstable internet, and varied teacher readiness often limit its application. By synthesizing recent international research, this review identifies practical solutions, including low-cost AR applications, collaborative project-based learning, and teacher training programs. It concludes that equity in AR-based arts education requires not only technological resources but also systemic support in curriculum, professional development, and policy aligned with the Sustainable Development Goals (SDGs). These insights are relevant for Indonesia, where arts education sustains cultural identity while promoting inclusive and transformative learning.

Introduction

Art education plays a strategic role in developing students' aesthetic, moral, and cultural awareness. According to (Masunah, 2020), art education is not merely oriented toward artistic skills but also aims to cultivate sensitivity, social empathy, and appreciation of cultural values. This aligns with (Dewey, 1934) perspective that aesthetic experience in art education is a reflective process that connects knowledge, feeling, and action holistically. Through art learning, students are expected to understand the values, meanings, and cultural symbols embedded in every work of art.

In the context of 21st-century education, art is no longer taught as a standalone activity but as an integral part of learning that fosters critical, creative, collaborative, and communicative thinking skills (Trilling & Fadel, 2009). The development of digital technology has also expanded the scope of art education. One of the most promising innovations is augmented reality (AR), a technology that integrates real and virtual elements interactively (Azuma, 1997). In art learning, AR enables students to explore visual elements such as form, pattern, movement, and structure in an immersive and contextual way. (Boboc et al, 2023) demonstrated that AR implementation strengthens students' understanding of cultural heritage and enhances their learning.

However, implementing technology-based art learning such as AR in Indonesian junior high schools still faces several challenges. Based on field observations, students' level of cultural literacy remains underdeveloped and requires significant improvement. According to the indicators of cultural literacy outlined by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek, 2021), which include cultural knowledge, understanding of cultural values, participation in cultural activities, and attitudes toward cultural preservation most students have not yet been able to recognize or appreciate regional artworks and need encouragement to participate actively in school cultural programs. This

indicates that the aspect of cultural understanding has not yet been optimally developed in art learning.

This finding aligns with (Rohini et al, 2023) who emphasized that students still struggle to appreciate dance artworks because teaching often emphasizes technical aspects rather than cultural meaning. Furthermore, the limited use of innovative learning media hinders students from connecting their learning experiences with socio-cultural contexts. Through approaches such as AR, students can gain more meaningful aesthetic and cognitive experiences related to local culture (Krippendorff, 2018).

However, implementing technology-based art learning such as AR still faces challenges. (chen et al., 2024) A study in heritage museums shows that the digital divide remains a major obstacle to equitable AR integration in education. Differences in technological infrastructure, device availability, and teachers' digital literacy contribute to unequal access to AR-based learning. Meanwhile (Gemiharto et al., 2022). emphasized that teacher readiness and policy support are also critical factors influencing successful AR adoption in schools.

In addition to access, teacher readiness is also a crucial factor. According to (Gemiharto et al., 2022), most art teachers still lack sufficient pedagogical and technological competence to design AR-based learning. Consequently, digital technology is often used only for presentations or video playback, without meaningful pedagogical integration. Teachers, however, play a vital role as facilitators who connect technology with the cultural values embodied in artworks. From a policy perspective, the integration of technology into art learning still requires reinforcement through curriculum implementation. The *Merdeka* Curriculum (Kemendikbudristek, 2022) provides opportunities for teachers to design project- and technology-based learning, yet policy and training support must be expanded to ensure that innovations like AR can be applied equitably across schools ok (Nussbaum, 2011).

Based on these issues, this study aims to review various research findings related to the implementation of augmented reality in art education, focusing on equity and access. This literature review seeks to provide a comprehensive understanding of how AR can be utilized to enhance students' cultural literacy at the junior high school level while supporting inclusive and equitable education aligned with the fourth goal of the Sustainable Development Goals (SDGs) (Snyder, 2019).

Method

This study employs a literature review method using a descriptive qualitative approach. The review focuses on the issues of equity and access in the application of augmented reality (AR) within art education, particularly in dance learning at the junior high school level. Its purpose is to examine previous studies on AR's potential to improve students' cultural literacy and identify obstacles to its implementation in schools.

Data sources were obtained from academic articles and journals published between 2019 and 2024 through searches on Google Scholar and ResearchGat*e*. Five main studies relevant to the topic were selected and analyzed using content analysis to identify key themes regarding AR's potential, challenges, and strategies for achieving equitable art education.

Result and Disscussion

After reviewing several studies, augmented reality was found to hold substantial potential to enrich art learning experiences. The study by (Garzon et al., 2019) investigated the impact of augmented reality (AR) on students' learning effectiveness across various educational levels. By synthesizing results from experimental and quasi-experimental studies, the authors concluded that AR consistently improves students' motivation, attention, and

conceptual understanding through immersive visualization. The novelty of this study lies in its quantitative evidence, demonstrating that AR is not merely an attractive tool but an effective medium for enhancing learning outcomes. In the context of junior high school arts education, particularly dance, these findings highlight that AR can provide a meaningful solution to increase student engagement while addressing equity by making abstract cultural elements more accessible through.

(Stylianou et al., 2025) in *Multimodal Technologies and Interaction* examined the integration of AR into collaborative and project-based learning. Their findings reveal that AR fosters creativity, reflective thinking, and teamwork by providing interactive and participatory environments. The novelty of this article is its emphasis on collaborative creation rather than individual engagement, showing that AR can transform learning into a collective cultural experience. Applied to junior high schools, this perspective implies that AR-supported project-based learning in dance education not only strengthens students' artistic skills but also promotes cultural literacy by encouraging them to co- construct cultural meaning in group .

The study by (Boboc et al., 2022) published in *Applied Sciences* provided an overview of a decade of AR applications in cultural education. Their review confirmed that AR has been widely used to preserve, visualize, and transmit cultural heritage, making intangible cultural values more tangible and accessible. The novelty of their findings is in showing how low-cost, mobile-based AR applications have expanded the reach of cultural education beyond museums and formal settings. For junior high schools, this implies that AR can bridge the gap between traditional cultural expressions and students' everyday digital experiences, fostering equitable access to cultural literacy by integrating local heritage directly into the classroom.

Equity concerns are further elaborated in the study of (Halim & Hidayat, 2025) analyzed the sequential levels of the digital divide among Indonesian students. Their research identified four stages of inequality: access, skills, use, and educational outcomes. The novelty of this work is its contextual focus on Indonesian education, which resonates strongly with the challenges of AR implementation in schools with diverse resource availability. For junior high school art education, the findings imply that while AR offers innovative opportunities, policymakers and educators must address infrastructural gaps and provide equitable solutions—such as offline AR resources or shared-device strategies—so that all students can benefit, regardless of socio-economic background.

Teacher readiness has also emerged as a critical factor in AR-based education. (Piedade and Batista, 2025) examined teachers' perceptions of AR and found a clear discrepancy between pedagogical enthusiasm and technological competence. While most teachers recognize AR's pedagogical potential, many lack the digital skills to implement it effectively. The novelty of their findings lies in identifying this gap as a systemic barrier to innovation. In junior high school art education, this highlights the importance of professional development and training programs that equip teachers with both technical and pedagogical knowledge to ensure AR can be integrated meaningfully into dance and cultural literacy instruction.

Lastly, (silva et al., 2023) explored participatory AR activities such as narratives, games, and crafts to promote cultural education. Their findings demonstrate that AR can shift students from passive recipients to active participants in cultural learning. The novelty of this article lies in showing how participatory design of AR activities fosters deeper cultural engagement. For junior high schools, incorporating participatory AR approaches in dance education can empower students to embody cultural practices creatively, thereby enhancing equity by ensuring all learners actively engage with cultural content, not just observe.

Conclusion

This literature review confirms that augmented reality (AR) has demonstrated strong potential to enhance learning outcomes in arts education by increasing motivation, collaboration, and cultural engagement. Recent studies show that AR not only improves students' attention and conceptual understanding but also provides innovative opportunities for project-based and participatory learning approaches. These features are particularly relevant for junior high school students, where active engagement and cultural literacy are central to arts education.

Nevertheless, challenges remain in terms of equity and access. The digital divide in Indonesia continues to create disparities in infrastructure, device ownership, and digital skills, while teacher readiness and technological competence remain uneven.

Addressing these challenges requires policies that support inclusive infrastructure, the adoption of mobile and low-cost AR applications, and ongoing teacher training. The novelty of this review lies in highlighting the intersection between AR adoption, equity, and cultural literacy in the junior high school context. By synthesizing recent findings, this study provides valuable implications for educators and policymakers, showing that AR can serve as both a technological innovation and a cultural bridge. Ensuring equitable access to AR-enabled arts education will be critical to fostering creativity, collaboration, and cultural appreciation among junior high school students in Indonesia.

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