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Implementation of Augmented Reality in Teaching Local History to Elementary Students

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ABSTRACT

Learning local history at the primary school level plays a crucial role in shaping students' identity, character, and cultural awareness from an early age. Through stories from the surrounding environment, students have the opportunity to recognize local wisdom values and understand social dynamics that are close to their lives. Unfortunately, history learning in schools is still primarily delivered conventionally - text-based and memorized - which often makes students less interested and not actively involved. This research aims to examine the potential of Augmented Reality (AR) technology in reviving local history learning to make it more meaningful and enjoyable for students. The research employed a literature study method and a qualitative descriptive approach, analyzing 25 sources of scientific literature published between 2006 and 2025 through content analysis techniques. The research shows that AR technology can present historical material visually, interactively, and contextually, thereby strengthening students' cognitive understanding while fostering emotional involvement in the learning process. However, the effectiveness of AR is strongly influenced by the readiness of teachers in techno-pedagogical aspects, the growing digital culture in schools, and the availability of adequate supporting infrastructure.

Informasi Artikel

Kata Kunci:
Augmented Reality; Sejarah Lokal; Pembelajaran IPS; Sekolah Dasar;

ABSTRAK

Pembelajaran sejarah lokal di tingkat sekolah dasar memegang peran penting dalam membentuk jati diri, karakter, serta kesadaran budaya siswa sejak dini. Melalui kisah-kisah dari lingkungan sekitar, siswa berkesempatan mengenal nilai-nilai kearifan lokal dan memahami dinamika sosial yang dekat dengan kehidupan mereka. Sayangnya, pembelajaran sejarah di sekolah masih banyak disampaikan secara konvensional—berbasis teks dan hafalan—yang sering kali membuat siswa kurang tertarik dan tidak terlibat secara aktif. Penelitian ini bertujuan untuk menelaah potensi teknologi Augmented Reality (AR) dalam menghidupkan kembali pembelajaran sejarah lokal agar lebih bermakna dan menyenangkan bagi siswa. Penelitian menggunakan metode studi pustaka dan pendekatan deskriptif kualitatif, sebanyak 25 sumber literatur ilmiah yang diterbitkan antara tahun 2006 hingga 2025 dianalisis melalui teknik analisis isi. Penelitian menunjukkan bahwa teknologi AR mampu menyajikan materi sejarah secara visual, interaktif, dan kontekstual, sehingga memperkuat pemahaman siswa secara kognitif sekaligus membangun keterlibatan emosional dalam proses belajar. Meski demikian, efektivitas AR sangat dipengaruhi oleh kesiapan guru dalam aspek teknopedagogis, budaya digital yang tumbuh di sekolah, serta tersedianya infrastruktur pendukung yang memadai.

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1. INTRODUCTION

Basic education is a strategic level in shaping the foundation of knowledge, character, and identity of students. In the era of globalization and the 4.0 industrial revolution, basic education is not only required to develop fundamental competencies such as literacy and numeracy but also plays a crucial role in strengthening national values and fostering an understanding of local culture (Ahmadi & Ibda, 2019). Social Studies (IPS), as a subject that encompasses social, historical, and cultural dimensions, plays an important role in fostering historical awareness and self-identity among students from an early age (Kemendikbudristek, 2022).

However, research findings indicate that elementary school students' interest in history education, particularly local history, remains relatively low. According to the Social Studies Learning Evaluation Survey by the Education Assessment Center (2021), only 28% of students expressed enjoyment toward history lessons, and over 60% felt that history material was boring due to its rote nature. One of the causes is the conventional teaching approach, limited use of visual media, and lack of interactive elements. As a result, local history material becomes less memorable and fails to foster a sense of belonging to the local cultural identity (Choiriyah et al., 2025; Prasetyo et al., 2025; Widodo, 2020; Zidah & Afandi, 2025). By learning about their local history, students can gain insight into local wisdom, the spirit of struggle, and social dynamics that are closely tied to their reality. The Merdeka Curriculum also emphasizes the importance of differentiated and contextual learning, making the strengthening of local history an integral part of efforts to ground social studies education (Mahmud, 2024; Nazmi, 2023). Unfortunately, the lack of innovative teaching materials is one of the factors limiting the exploration of local history in daily classroom practice.

The development of digital technology, such as Augmented Reality (AR), presents a new opportunity to address this challenge. AR enables the integration of real-world and digital elements in real time, providing a more immersive, interactive, and enjoyable learning experience (Hariyono, 2023; Hernanda & Aji, 2024; Kafilahudin & Akbar, 2024; Tasya'ah et al., 2025). Ibáñez & Delgado-Kloos (2018) reported that the application of AR can increase student engagement by up to 40% compared to conventional methods. However, in practice, this technology is still more widely used in subjects such as science and mathematics and has not yet been fully integrated into social studies education, particularly in local history.

Several studies have demonstrated the significant potential of AR in enhancing students' understanding and interest in history. A study by Suprapto et al., (2024) demonstrated the success of an AR-based art history textbook in enhancing students' understanding and interest in locally based art objects. Similarly, Wahiddiyah et al., (2023) that the use of AR in social studies learning enables the presentation of historical information in a visually and interactively engaging manner, making learning more accessible and adaptable to students' abilities. However, the accessibility of technology and teachers' digital literacy remain significant challenges that require serious attention.

Teachers' digital literacy challenges are also emphasized by Suprapto et al., (2024) who examined the use of artificial intelligence (AI) technology in education. This study revealed

that integrating technology into education requires a strong epistemological and ethical approach so that it does not merely pursue efficiency but also upholds educational values. In line with this, Gandana et al., (2023) emphasize the importance of an ethnopedagogical framework in the development of digital media. According to them, technology-based media must remain grounded in cultural values and local norms to avoid being detached from the societal context.

The readiness of institutions and digital culture in the school environment are also determining factors. Idrus (2014) his research on academic information systems in high schools in Jambi City highlights that the effectiveness of management, ICT culture, and the quality of human resources greatly influence the success of educational technology implementation. This is even more relevant when considering the readiness of teachers and elementary schools to apply AR technology as a medium for teaching local history. In fact, according to Indriani et al., (2025) the use of innovative learning models, such as Problem-Based Learning (PBL), also requires teachers to possess mature pedagogical readiness, enabling social studies learning to truly cultivate 21st-century skills in students, including critical thinking and problem-solving.

In addition to AR, other technological approaches, such as podcasts, have also proven to be effective. Asmi (2019) reported that the use of podcast-based audio media in local history materials in South Sumatra can significantly improve students' understanding, with an N-gain value of 0.72 (high category). Although not AR-based, this study demonstrates that contextual and interactive digital media have significant potential to enhance the effectiveness of history learning.

Furthermore, a study Utari et al., (2021) that developed local history learning media based on virtual reality (VR) shows that the use of visual technology can replace the need for physical field trips. The VR application for introducing Pasuruan's cultural heritage proved to provide a better understanding while facilitating a contextual and efficient learning process.

Although various studies have shown the success of AR and other digital media in improving learning quality, significant research gaps remain. First, few studies specifically examine the effectiveness of AR in local history learning in elementary schools from cognitive (understanding), affective (interest), and social (cultural identification) perspectives (Day et al., 2006; Eccles & Wigfield, 2020; Jagers et al., 2025; Monroe et al., 2019; Paris & Paris, 2003; Wang & Degol, 2017). Second, there are no studies that explicitly link the psycho-pedagogical characteristics of elementary school-aged children with how they interpret local history through AR media. Third, the readiness of teachers and the school ecosystem to implement AR, both in terms of techno-pedagogical competencies and supporting infrastructure, remains an aspect that has received insufficient attention.

Based on these issues, this study aims to address the need for contextual, enjoyable, and meaningful innovations in local history learning for elementary school students. The primary focus is on the use of Augmented Reality technology as a medium for learning local history to increase student engagement, understanding, and appreciation for regional cultural heritage. This research also seeks to bridge the gap between technological potential and educational practices at the elementary level through a comprehensive data-driven, contextual, and pedagogical approach.

2. METHOD

This research employs a literature review method with a descriptive qualitative approach. The primary focus is on analyzing theories, research findings, and relevant scientific publications regarding the use of Augmented Reality (AR) technology in local history education at elementary schools. The data sources comprise 25 scientific literature pieces, including journal articles, dissertations, conference proceedings, and research reports published between 2006 and 2025. The selection of sources was based on relevance to the topic, recency, and full accessibility through databases such as Google Scholar, Garuda, DOAJ, and ScienceDirect.

The criteria for the literature included a focus on elementary education, the use of digital media, the strengthening of local history, and the implementation of AR or similar technologies. The data were analyzed using content analysis, which involved data reduction, theme identification, and critical content interpretation. This process resulted in the grouping of findings based on key issues, including the effectiveness of AR media, teacher readiness, and the integration of technology in the context of contextual learning. Findings from the literature were used to develop a conceptual synthesis, strengthen arguments, and identify gaps that could serve as a basis for further research.

3. RESULT AND DISCUSSION

1. Improving Students' Understanding of Local History through Augmented Reality (AR)

Students' understanding of local history is a crucial aspect in shaping their identity, national values, and appreciation of regional culture. However, challenges faced in teaching local history at the elementary school level include low student interest in learning, the dominance of conventional methods that are text-based and rely on memorization, and the limited availability of media relevant to students' lives. Technology-based learning innovations, particularly Augmented Reality (AR), emerge as a potential solution to address these challenges.

AR enables the integration of real-world and digital elements, such as images, videos, and three-dimensional objects, directly into the learning process. With this approach, local history is not only conveyed verbally or textually; it is also presented visually. However, it can be visualized and presented in an immersive manner, thereby enhancing students' cognitive absorption of the material, including improved understanding of historical concepts.

Several studies have been conducted to test the effectiveness of AR in the context of history learning, both at the elementary school and university levels. The findings from these studies show mixed results—most are supportive, but there are also important notes regarding limitations in implementation. The following is an analysis of several previous research results that support, question, or provide a neutral perspective on the effectiveness of AR in improving students' understanding of local history.

Research Supporting Improved Understanding Through AR Research by Wahiddiyah et al., (2023) explicitly asserts that the use of AR technology in social studies learning, particularly in the presentation of historical material, can increase student engagement and

understanding. AR provides additional visual and interactive information, such as displaying historical figures or important events in the form of three-dimensional projections accessible via mobile devices. In this context, history is not only read but also "seen" and "experienced directly" by students, thereby strengthening and enriching the cognitive process.

Similarly, Juliawan et al., (2024) demonstrated, through the development of an AR-based art history textbook, that students using this medium experienced a significant improvement in understanding art objects and their historical context. Although the context is in higher education, these results remain relevant for elementary schools because they emphasize the power of AR in conveying abstract content in a concrete and contextual manner. Additionally, this research highlights the importance of integrating visual elements and narrative within a single interactive platform, thereby making learning more engaging and effective.

Neutral Research: Potential Support Limited by Technical Factors and Readiness Meanwhile, Nafi'ah et al., (2022) did not directly examine students' understanding but highlighted the importance of teacher readiness in developing AR-based learning media. In a history teacher training program in Malang, it was found that the majority of teachers were unfamiliar with AR media prior to the training; however, after completing the training, they demonstrated the ability to create relevant AR media. This indicates the significant potential of AR for broader use but also emphasizes that the success of improving student understanding is not solely determined by the media itself but also by teachers' ability to design and implement it effectively.

Similarly, Utari et al., (2021) who developed virtual reality (VR) media for local history learning, found that such visual technology provides a better understanding of historical objects. Although the media used was VR, not AR, the essence of immersive learning remains the same. However, this study also highlights limitations in terms of infrastructure and the need for comprehensive integration of technology into the education system.

Alternative Approach: Interactive Audio and Its Implications for AR. A study by Asmi, (2019) took a different approach by developing audio-based podcast media for local history learning (Sriwijaya). Although not AR, the research results showed a significant improvement in historical understanding, with an N-gain value of 0.72 (high category). These findings suggest that interactive media, whether visual (such as AR) or audio (like podcasts), both have great potential for enhancing student understanding. However, AR-based visual media has a distinct advantage in presenting historical objects spatially and concretely, compared to solely through audio narration.

Preliminary Conclusions From the above studies, the use of AR-based learning media shows a positive trend in enhancing students' understanding of local history material. The visual, interactive, and contextual approach offered by AR bridges the gap between historical content and students' real-life experiences. However, the effectiveness of AR does not stand alone. Supporting factors, such as teacher readiness, access to technology, and institutional support, also significantly influence the success of AR as an educational medium.

Therefore, further research is needed that not only measures student learning outcomes but also simultaneously considers pedagogical and technological aspects. This study aims to address this gap, particularly in the context of local history education in Indonesian elementary schools.

2. Technopedagogical Competence of Teachers in the Digital Age

Digital transformation in education has brought significant changes in teaching approaches, including demands for new competencies that teachers must possess. One of them is techno-pedagogical competence - the ability of teachers to integrate technology effectively and pedagogically into the learning process. This competency encompasses not only technical skills in operating software and hardware but also a critical understanding of how technology can be leveraged to enhance learning experiences, particularly in the context of local history education in primary schools. It is no longer enough for teachers to be content with being teachers but also to be facilitators who can create contextual, interactive, and meaningful digital learning environments. This aligns with the era of the Industrial Revolution 4.0 and the Merdeka Curriculum policy, which emphasizes technology-based learning and differentiation.

Research Simamora (2024) highlights the importance of technology integration in learning by examining the use of the Canva application in learning directions for grade IV. Although the focus was not directly on Augmented Reality (AR), the findings from this study suggest that teachers have great potential to use technology creatively to enhance the appeal and effectiveness of learning. However, this study also highlights the challenges of cultural resistance, limited digital literacy, and the need for an ethical framework in the use of technology, all of which are also relevant to teacher readiness in implementing AR. This suggests that teachers' techno-pedagogical competence is not solely determined by technical training but also by critical attitudes and professional ethics in the use of technology.

Furthermore, in the context of early childhood education, Gandana et al., (2023) emphasized that the digitization of educational media can be a space for science exploration and innovation. However, it must still be grounded in ethnopedagogic values. Teachers are required not only to be technically proficient but also to maintain local values, culture, and wisdom in every digital product they develop. This is particularly relevant in the context of AR-based local history learning in elementary schools, where teachers must balance technological sophistication with local content that is reflective and contextual. The challenge in technology integration is not only about the availability of tools but also about teachers' ability to continue using education as a tool for cultural preservation through innovative media.

Meanwhile, the research Idrus (2014) emphasizes managerial aspects and academic information systems at the senior high school level. However, it provides important insights into the importance of ICT (Information and Communication Technology) culture in educational institutions. This culture should be instilled not only in the administrative context but also in the learning environment. The effectiveness of technology use in schools is correlated with the quality of human resources and the availability of ICT facilities. From this perspective, enhancing teachers' techno-pedagogical competence in AR-based local history learning is also highly dependent on the innovative culture established by the school institution as a whole, including encouragement from the principal and the availability of suitable infrastructure.

Furthermore, Indriani et al., (2025) emphasized the importance of pedagogical understanding in implementing problem-based learning (PBL) models in social studies subjects in elementary schools. This research does not directly address technology, but it

shows that innovative learning approaches, such as PBL, require a strong methodological understanding from teachers. In the context of AR technology, the same applies: AR is not just about sophisticated devices but also about how teachers can design problem-based learning, exploration, and reflection aided by digital visualization. Without a strong pedagogical foundation, advanced technology risks becoming merely an entertainment tool that lacks educational profundity. Therefore, techno-pedagogical competence should include an integrative understanding of pedagogy, content, and technology (TPACK: Technological Pedagogical Content Knowledge).

In contrast, Siregar & Yahfizham (2025) showed that the utilization of Microsoft Mathematics-based technology can positively improve students' concept understanding and learning motivation through abstract visualization. Although the field is mathematics, the implications of this research are relevant to the field of history as both can benefit from visualization features in bridging concepts that are difficult for students to understand. This research shows that teachers who are competent in operating interactive digital media will find it easier to help students understand the material concretely. However, such an achievement requires digital literacy skills, intensive training, and teachers' willingness to learn—key components of techno-pedagogical competence.

It can be concluded that teachers' techno-pedagogical competence in the digital era is a key requirement in the successful implementation of Augmented Reality for local history learning. Teachers must not only be able to operate the technology but also understand how it can be used to effectively achieve learning objectives, strengthen cultural values, and facilitate students in building a contextualized understanding. The challenge ahead is to enhance teacher readiness through continuous training, foster a digital culture in schools, and provide systemic support from education stakeholders so that the implementation of AR in local history learning is not just a fleeting trend but a sustainable transformation.

4. CONCLUSION

The utilization of Augmented Reality (AR) in local history learning in elementary schools has the potential to increase students' understanding, interest, and engagement through visual, contextual, and interactive presentation of materials. The success of AR implementation is strongly influenced by teachers' techno-pedagogical competence, infrastructure readiness, and support from the school ecosystem. Limited digital literacy and a lack of training are challenges that need to be addressed so that this technology can be utilized optimally.

Future researchers are advised to conduct empirical studies to directly measure the impact of using AR on student learning outcomes in various contexts. Continuous teacher training and development of AR media based on local cultural values are also important to ensure the relevance and sustainability of innovations in basic education.

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