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Transformation of history learning methods in the digital era: Challenges and opportunities in schools

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Abstract. The rapid transformation of education in the digital era has created an urgent need to reexamine history teaching methods to ensure their relevance to the needs of today's learners. This study aims to investigate the implementation of digital technology in history education in secondary schools in Pontianak, focusing on its impact on student engagement, the challenges encountered, and the opportunities that can be leveraged to enhance learning effectiveness. The research subjects consisted of history teachers and students from four public high schools, selected through purposive sampling based on their experience in integrating technology into history instruction. This research employed a qualitative phenomenological design, with data collected through in-depth interviews, classroom observations, and learning documentation. The findings indicate that the use of technologies such as documentary videos, historical simulations, and digital learning platforms enhances students' engagement with historical content, enabling them to learn more interactively and independently. Identified challenges include inadequate infrastructure, limited digital literacy, and unequal access to technological resources. Nevertheless, digital platforms and technologies such as virtual reality (VR) and augmented reality (AR) offer considerable opportunities to enrich historical learning experiences through their flexibility and immersive potential. The study recommends enhancing technological infrastructure, offering ongoing professional development for teachers, and implementing policies that promote equitable access to technology to optimize the digital transformation of history education.

Introduction

The global transformation of education in the digital era has fundamentally reshaped the way teaching and learning are conceptualized and implemented. Among the disciplines experiencing significant change is history education, which has traditionally relied on static, text-based instruction. Recent advances in digital technologies have catalyzed a shift toward more dynamic, student-centered pedagogies that prioritize interactivity, engagement, and accessibility (Marpelina et al., 2024). The integration of digital tools in history education is increasingly recognized for its potential to provide immersive learning experiences, allowing students to engage with historical content beyond the limitations of conventional classroom methods (Carretero et al., 2022). Through access to multimedia resources, ranging from digital archives and documentary videos to interactive maps, simulations, and e-learning platforms, students can explore complex historical narratives in a more visual, personalized, and critically reflective manner.

This transformation extends beyond content delivery. Digital technologies also support inclusive pedagogical approaches by enabling inquiry-based learning, gamification, and collaborative projects that foster active participation and critical thinking (Ni, 2023; Hendra et al., 2025). Emerging technologies such as Virtual Reality (VR) and Augmented Reality (AR) have further enhanced the learning environment, offering students immersive experiences that allow for deeper emotional and cognitive engagement with historical events (Marpelina et al., 2024). These tools provide not only the opportunity to visualize past contexts but also to simulate perspectives and reconstruct historical environments, thereby promoting historical empathy. Additionally, methods such as digital storytelling and collaborative learning platforms have expanded the boundaries of historical pedagogy, enabling learners to co-construct meaning and participate in transdisciplinary explorations of the past (Banerjee, 2024; Sartika & Syafryadin, 2025).

Specifically, the technologies considered most appropriate for integration in history learning include digital archives for source-based analysis, interactive historical maps for spatial-temporal understanding, documentary films for visual interpretation of past events, Google Classroom for asynchronous discussion and assignment management, and immersive tools such as virtual reality (VR) and augmented reality (AR) for experiential learning and emotional engagement. These tools offer both pedagogical value and practical adaptability within the constraints of Indonesian classrooms.

Nevertheless, the integration of digital technologies into history education in Indonesia, particularly at the secondary school level, remains uneven. Despite growing interest and efforts in this direction, several systemic barriers hinder the effective adoption of digital-based learning strategies. These include limited access to digital infrastructure, insufficient teacher training, low levels of digital literacy among educators and students, and the digital divide across urban and rural regions (Anderson & Rivera-Vargas, 2020). Such challenges are especially pronounced in contexts where internet connectivity is unreliable, digital tools are scarce, and support for integrating technology into pedagogy is minimal. Consequently, the transformative potential of technology in enriching history education remains underutilized.

Yet, alongside these challenges, there are considerable opportunities. Digital learning environments provide students with access to a broader range of historical perspectives, enable self-paced and autonomous learning, and foster lifelong learning habits through flexible platforms. Tools such as e-learning modules, online discussion forums, and mobile apps facilitate out-of-class engagement, allowing students to revisit and reflect on historical content at their convenience (Neborsky et al., 2020). Furthermore, technology provides innovative means to engage students with abstract or complex historical themes through visualization, reenactment, and interaction, elements often lacking in traditional textbook-centered instruction (Buzzard et al., 2011). The effective use of digital resources can therefore significantly improve both comprehension and motivation in history education, aligning learning processes with 21st-century educational competencies (Sumandya et al., 2022).

Despite the growing body of literature on educational technology, a significant gap remains in research focusing specifically on the digital transformation of history education in Indonesian secondary schools. While many studies address technology use in education in general terms, few examine the nuanced impacts of digital tools on students' engagement with historical content and the broader pedagogical implications for history instruction. Moreover, limited scholarly attention has been devoted to the infrastructural and skill-based barriers that teachers and students face when integrating technology into the history classroom (Banerjee, 2024; Sumintho, 2023).

This study addresses these gaps by offering a context-specific examination of secondary schools in Pontianak, a medium-sized city in Indonesia. Unlike previous research that often highlights

technology in general classroom settings or focuses on STEM subjects, this study contributes novelty by exploring the pedagogical potential and practical constraints of digital integration within the domain of history education. The research emphasizes not only student engagement but also the interrelated dimensions of teacher readiness, infrastructure availability, and content adaptability, areas that remain underexplored in prior studies.

Accordingly, this study aims to investigate: (1) how the use of digital technology affects student engagement in history learning; (2) what challenges are encountered by teachers and students in implementing technology in the history classroom; and (3) what opportunities exist to improve the effectiveness of digital-based history education. By grounding its inquiry in empirical data and real classroom contexts, the study seeks to offer both theoretical insights and practical guidance for policymakers, curriculum developers, and history educators aiming to modernize the teaching of history in a digitally connected world.

Method

Research Design

This study employed a qualitative phenomenological design, aiming to explore the subjective experiences and meanings provided by history teachers and students regarding the use of digital-based history teaching methods. The phenomenological approach was chosen because its primary focus is on the deep experiences of participants in a specific context, which in this case is the implementation of technology in history education. Phenomenology allows the researcher to explore the views, feelings, and thoughts about the ongoing phenomenon. This aligns with the perspective of Creswell and Creswell (2018), who stated that phenomenology provides an in-depth understanding of individuals' subjective experiences related to a phenomenon, in this context, the use of technology in history education.

Research Subjects

This study involves history teachers and students from four high schools in Pontianak: SMA Negeri 1 Pontianak, SMA Negeri 2 Pontianak, SMA Negeri 3 Pontianak, and SMA Negeri 5 Pontianak, selected using purposive sampling. A total of six history teachers participated in this study, consisting of two teachers from SMA Negeri 1 Pontianak, one teacher from SMA Negeri 2 Pontianak, two teachers from SMA Negeri 3 Pontianak, and one teacher from SMA Negeri 5 Pontianak. Participants were selected based on their experience in integrating technology into the teaching of history. The selection aimed to gather in-depth information about their experiences and perceptions regarding the application of technology in the teaching of history.

Data Collection Techniques

Data were collected using several relevant techniques to explore participants' in-depth experiences, as follows:

Table 1. Collection Techniques

In-depth Interviews	Interviews were conducted with history teachers and students to explore their views on the use of technology in history education. In-depth interviews enable the researcher to collect subjective data and gain a comprehensive understanding of individual experiences related to the use of technology in teaching history. The in-depth interview technique was selected because it provides participants with the opportunity to share their experiences directly, in line with the principles of phenomenology, which aim to understand subjective meanings within the context of their experiences (Creswell & Poth, 2016). The interview questions are developed based on five main dimensions: (1) technology integration (types and frequency of use, alignment with

	curriculum); (2) instructional strategy (models or approaches used to support digital delivery); (3) student engagement (student responses and participation levels); (4) barriers and solutions (technical, pedagogical, or infrastructure-related constraints); and (5) institutional support (school facilities, digital access, teacher training).
Classroom Observations	Observations will be conducted in classrooms that use technology in history education. These observations aim to understand how technology is used in practice and the interactions between teachers and students in this context. The observation technique was chosen because it allows the researcher to directly observe how technology is applied in learning activities and how interactions between students and teachers occur. This provides valuable contextual data that cannot be gathered through interviews alone (Miles et al., 2014).
Learning Documentation	Documentation of the teaching materials used in the classroom, including applications, educational videos, and historical modules implemented by teachers, will be collected. Documentation provides objective insights into the types of technology used in history education and how these materials are integrated into the curriculum. Documentation was chosen because it allows the researcher to analyze the tools used in learning and their relevance to the learning objectives (Creswell & Poth, 2016).

Data Analysis

Data analysis in this study will follow Huberman's data analysis theory, which includes the following four stages:

Table 2. Data Analysis

Data Collection	Data will be collected through interviews, observations, documentation, and reflection journals. Data collection will be carefully conducted to ensure that the information gathered provides a comprehensive picture of the perceptions and experiences of both teachers and students in digital-based history education.
Data Reduction	The collected data will be filtered to find the most relevant and important information. This process of data reduction is essential for simplifying complex information and focusing the analysis on relevant themes, such as the perceptions and experiences of technology users in history education.
Data Presentation	The reduced data will be presented in the form of themes that emerge from the interviews, observations, and reflection journals. This presentation of data aims to facilitate the researcher's understanding of how the experiences and perceptions of students and teachers relate to digital-based education, and how technology supports or hinders the learning process.
Conclusion Drawing	Based on the data analysis, the researcher will conclude the meaning of the experiences described by the participants. These conclusions will encompass the primary findings on how digital-based history education impacts students' motivation, understanding, and engagement, as well as the challenges faced by teachers in its implementation.

To ensure the credibility and completeness of findings, the results from interviews, classroom observations, and documentation were triangulated. The researcher compared the themes that emerged from teacher and student interviews with observational field notes and classroom materials (e.g., digital content, *RPP*, apps used) to ensure consistency and depth of analysis. This

triangulation process strengthened the validity of the data interpretation, ensuring that the conclusions drawn reflected a holistic view of the phenomenon.

This approach is highly suitable for qualitative research because it enables the researcher to systematically organize data, facilitating the drawing of meaningful conclusions and providing a deep understanding of the phenomenon under investigation. The stages of data reduction and data presentation are crucial for filtering relevant information and presenting it in a clear, easily understandable, and analyzable form (Miles et al., 2014). This research method is designed to obtain a deep understanding of the experiences of teachers and students regarding the use of technology in history education. By employing the phenomenological approach integrated with Huberman's data analysis theory, this study aims to provide valuable insights into the challenges and opportunities faced in the implementation of digital-based learning.

Results and Discussion

The Application of Technology in History Education Affects Student Engagement

The integration of digital technologies into history education has demonstrated a significant influence on enhancing student engagement across various stages of the learning process. Drawing from data gathered through interviews with teachers and students, as well as classroom observations and analysis of instructional documentation, it is evident that the use of digital tools, such as documentary videos, historical simulations, and virtual reality (VR)-based applications, has encouraged more active and participatory student involvement with historical content. These tools have proven particularly effective in presenting historical narratives in a format that is both visually rich and intellectually stimulating, thereby fostering a deeper understanding of complex events. Teachers noted that documentary videos, in particular, serve as powerful pedagogical instruments, offering visual illustrations that clarify abstract historical concepts and supplement what traditional textbooks often fail to convey. Events such as the World Wars, for instance, are made more accessible and engaging through visual simulations and dramatized accounts, enabling students to connect emotionally and cognitively with the material (Alenezi, 2023; Qolamani & Mohammed, 2023).

These findings were reinforced by classroom observations, which recorded students' enthusiasm and concentration during video-based and simulation-enhanced lessons. Additionally, the lesson plans analyzed in this study included digital components such as YouTube links, Padlet activities, and interactive slides, demonstrating the structural incorporation of technology into lesson delivery.

In a similar vein, the use of interactive digital maps has been found to contribute meaningfully to the development of students' spatial and contextual understanding of historical developments. These tools allow learners to trace territorial transformations and explore geopolitical dynamics in a manner that textual explanation alone cannot provide. For example, lessons on colonialism or the Industrial Revolution become more comprehensive when students can visually explore the geographical spread and socio-political implications of these historical shifts. As Petousi et al. (2022); Widana & Ratnaya (2021) highlight, digital tools not only broaden access to historical perspectives but also facilitate more nuanced engagement with primary and secondary sources, enhancing students' capacity for historical reasoning and analysis.

Beyond content comprehension, digital platforms such as Google Classroom and Edmodo have introduced an added layer of flexibility and accessibility to the field of history education. These online learning environments enable students to access course materials asynchronously, thus allowing for continued learning beyond the constraints of classroom hours. Students can revisit

instructional videos, review readings, and complete assignments at their own pace, an approach that supports autonomous learning and accommodates diverse learning needs. This aligns with the findings of Katyeudo and de Souza (2022); Purnadewi & Widana (2023), who argue that the integration of educational technology fosters a more personalized learning experience, enabling students to tailor their learning journeys to their individual preferences and academic rhythms.

Student participants shared in interviews that they felt more "motivated," "curious," and "less bored" when engaging with historical topics using multimedia tools. Several expressed that they could "imagine past events more clearly" through video reenactments and virtual reality (VR) simulations. One student from SMA Negeri 3 Pontianak commented: "With videos, I can finally understand the feelings of the people who lived during the Japanese occupation. It feels more real." This emotional and cognitive resonance was not only observed in classroom behavior but also documented in their reflective journals, where students highlighted specific tools they found helpful for retaining historical information (Suhardita et al., 2024).

Nevertheless, while the flexibility offered by platforms such as Google Classroom is widely appreciated by students and teachers alike, it is important to acknowledge the pedagogical limitations of such tools. Although effective in disseminating content and managing assignments, these platforms are not ideally suited for facilitating deeper pedagogical interactions that require real-time dialogue and the nuanced interpretation of complex topics. Rahmawati et al. (2020) observe that Google Classroom is efficient for task management and resource distribution, yet insufficient in supporting critical discourse or in-depth conceptual exploration. This sentiment is echoed by Fitriningtiyas et al. (2019), who argue that while online platforms bring logistical advantages, including cost savings and improved communication, they should be regarded as supplementary rather than primary modes of instruction in the context of history education. In-person engagement remains indispensable, particularly when teaching abstract historical phenomena that require guided discussion, interpretative skills, and interpersonal exchange.

From the teacher interviews, it was found that technology integration is typically embedded into the inquiry-based learning model and the project-based learning model. Teachers assign multimedia exploration tasks, followed by historical analysis projects that involve digital presentations, timelines, or videos. However, teachers noted that technology is more suitable for thematic topics such as revolutions, world wars, and Indonesian independence, where visual aids enhance comprehension. For more abstract or conceptual topics, such as historiography or political theory, the use of technology is more limited and often relies on simpler digital formats, like slides or readings.

Furthermore, increased student participation in digital history learning is observable through their active involvement in online discussions, question-and-answer sessions, and collaborative digital projects. Students reported greater enthusiasm and improved recall of historical material when engaging with technology-enhanced content. While initial challenges in digital adaptation were noted, particularly among students unfamiliar with new platforms, many ultimately expressed a preference for multimedia-integrated instruction, citing increased clarity and interest in the subject matter. This observation is supported by Junior et al. (2024), who emphasize the importance of pedagogically sound integration of digital resources, alongside the need for sustained teacher training to maximize the educational potential of these technologies.

Compared to previous studies, such as those by Rahmawati et al. (2020) and Fitriningtiyas et al. (2019), which focused primarily on digital tools as teaching aids, this study uniquely integrates perspectives from both teachers and students while simultaneously analyzing classroom artifacts (e.g., *RPP*, digital modules). This triangulated approach provides a more comprehensive understanding of how digital tools impact not only instructional strategy but also learner

perception, motivation, and historical understanding, particularly in under-researched Indonesian urban contexts.

In summary, the application of digital technology in history education significantly contributes to increased student engagement by making content more accessible, visually compelling, and cognitively stimulating. Tools such as simulations, digital maps, and online platforms support a multidimensional approach to learning, facilitating both independent study and collaborative inquiry. However, the implementation of such technology must be approached with careful pedagogical consideration. It is essential to maintain a balance between digital efficiency and the preservation of interactive, human-centered learning experiences that foster critical thinking and historical empathy. As noted by Macgilchrist et al. (2020), the adoption of educational technology carries broader implications related to equity, access, and social inclusion, factors that must be addressed to ensure that digital transformation does not inadvertently reproduce or exacerbate existing educational disparities.

In this regard, Singh (2021) underscores the urgency of addressing the digital divide, cautioning that the promise of digital classrooms can only be realized if infrastructural and access-related challenges are systematically tackled. Without deliberate intervention, the uneven distribution of digital resources may deepen educational inequalities rather than bridge them. At the same time, Clark-Wilson et al. (2020) highlight the pivotal role of ongoing professional development and institutional support for teachers in ensuring that technology integration is not only technically competent but also pedagogically meaningful. Thus, while digital tools hold considerable promise for enriching history education, their effective application requires a holistic approach that encompasses infrastructure, teacher capacity, and inclusive learning design.

Challenges in Implementing Digital-Based History Education in Secondary Schools

Despite the evident benefits of integrating technology into history education in secondary schools across Pontianak, several implementation challenges continue to hinder its full potential. One of the most persistent and significant barriers involves infrastructural limitations, specifically, the inadequacy of digital devices and the unreliability of internet connectivity. Many schools report frequent technical disruptions that interrupt the learning process and reduce instructional efficiency. For instance, although teachers have increasingly incorporated documentary videos and historical simulations to enrich historical narratives, inconsistent internet access often impairs video streaming and interrupts the continuity of lessons. In several cases, these technical setbacks force educators to revert to traditional instructional methods, undermining the innovative potential of digital-based history education.

Furthermore, in numerous schools, both students and teachers encounter issues with device compatibility and accessibility. Some students are unable to access digital learning platforms or participate in online activities due to the limited functionality of their devices, which are often incompatible with required learning applications. Observational data showed that in SMA Negeri 2 and SMA Negeri 5 Pontianak, several students relied on older-generation smartphones with limited screen sizes and processing capacities, which affected their participation in interactive activities such as quizzes and collaborative mapping. These difficulties are compounded by the continued reliance on traditional textbook formats, many of which have been digitized without the corresponding infrastructure to support their use effectively. As highlighted by Junior et al. (2024), such dependence on outdated or poorly adapted resources limits opportunities for dynamic, interactive, and meaningful learning, stalling pedagogical innovation in history education.

Beyond hardware and connectivity issues, the use of digital platforms such as Google Classroom and Edmodo, although increasingly popular, presents its own set of challenges. These platforms, typically employed for quizzes, assignments, and asynchronous discussions, are not uniformly

accessible to all students. Variations in digital literacy among learners result in uneven levels of participation and engagement. Teachers reported that some students require extensive time and support to navigate these platforms, leading to disparities in learning outcomes. In addition, gaps in students' technological proficiency have emerged as a barrier to equity in digital-based learning environments. At the same time, some students adapt quickly to digital interfaces, while others struggle, creating a digital divide even within the same classroom.

During interview sessions, some students admitted feeling frustrated when they were unable to access video materials due to connectivity issues. Others expressed enthusiasm for the digital approach, especially when allowed to create multimedia projects such as digital posters or short documentaries. One student from SMA Negeri 3 stated, "I like learning history with videos, but I wish I could download them first at school because at home my signal is weak". Another student from SMA Negeri 1 noted that using Google Slides for group projects made her "feel more involved and confident in expressing opinions". These student narratives reflect both the hope and the challenge of digital integration in history education.

These observations are echoed by Marian et al. (2023), who assert that although platforms like Google Classroom are effective in promoting student participation, limited digital skills among specific student groups continue to hinder optimal engagement. Moreover, Matitaputty et al. (2024) stress the importance of digital competence as a foundational skill for engaging in project-based learning in history. Without sufficient training or exposure to digital tools, students are less likely to benefit fully from such pedagogical approaches. Consequently, variations in digital readiness among learners pose an ongoing challenge to the effective implementation of technology-enhanced history education.

Another critical challenge concerns unequal access to digital technology at home. Students who lack personal devices or have no access to stable internet connections outside of school face significant disadvantages. While digital learning platforms offer flexibility in terms of time and location, this flexibility is rendered meaningless for students unable to access learning materials from home. As noted by Aying et al. (2019), disparities in home access to technology can significantly affect student engagement in digital-based learning environments. Students with limited resources often fall behind, unable to complete assignments or participate in online activities at the same pace as their peers. This issue is compounded in areas where internet infrastructure is underdeveloped. Fahruddin et al. (2024) further confirm that learners in poorly connected regions often experience delays in accessing instructional content, negatively impacting their academic performance and motivation.

Document analysis revealed that teachers have attempted to adapt by providing offline versions of digital materials, including USB-based modules and printed QR codes, leading to downloadable content. However, this solution remains suboptimal due to uneven access to devices and digital navigation skills.

Teacher readiness is another area that presents considerable obstacles to the effective use of technology in history classrooms. While many educators have access to digital tools and platforms, not all possess the necessary pedagogical or technical expertise to integrate these tools effectively. Several teachers reported feeling underprepared to utilize platforms like Google Classroom to their full potential. Although some have initiated the use of such technologies, their application often remains limited due to a lack of structured training and ongoing professional support. Hutson and Olsen (2022) highlight that the effective use of tools such as virtual reality in history instruction requires more than access to technology; it necessitates targeted training that builds both technical proficiency and pedagogical confidence. Similarly, Skaraki and Kolokotronis (2022) emphasize that

the successful adoption of game-based applications, such as Actionbound, depends heavily on teachers' familiarity with the platforms and their ability to align digital tools with curricular goals.

From teacher interviews, it was found that digital technology is most frequently integrated through project-based learning, flipped classrooms, and inquiry-based models. Teachers reported that such integration is most effective for topics that are visually and narratively rich, such as revolutions, independence movements, and world conflicts. Abstract topics, such as historical methodology or constitutional development, were perceived as less adaptable to multimedia approaches. This selective integration pattern aligns.

Taken together, these findings suggest that the implementation challenges of digital-based history education in Pontianak schools are multifaceted. They span from infrastructural inadequacies and device limitations to disparities in digital skills among students and teachers. While digital tools offer transformative opportunities for enhancing student engagement, these benefits can only be fully realized when the accompanying challenges are addressed systematically and comprehensively. For example, Rahmawati et al. (2023) demonstrate that game-based learning in history classrooms significantly boosts engagement, but only under conditions of sufficient infrastructure and teacher preparedness. Similarly, Mastrianto et al. (2020) propose the development of digital textbooks based on local historical content as an innovative solution. Yet, this approach also hinges on access to compatible devices and reliable connectivity.

Compared to previous studies, this research uniquely integrates multi-source data (interviews, observations, and document review). It centers both student and teacher voices to highlight context-specific constraints in an Indonesian urban environment. The triangulated method provides a richer, more grounded understanding of the complexity of digital integration in history teaching, especially in areas with unequal digital access.

In light of these challenges, it becomes imperative to adopt a multi-level strategy aimed at optimizing the integration of technology in history education. This includes investing in infrastructure improvements, expanding access to digital devices, ensuring stable internet connectivity, and delivering ongoing professional development for teachers. More importantly, educational equity must remain at the center of any digital transformation effort to ensure that all students, regardless of their socio-economic background, can benefit from enriched, engaging, and inclusive history learning experiences.

Opportunities in the Use of Technology to Enhance History Education

The integration of digital technology in history education in secondary schools across Pontianak presents a range of strategic opportunities to enhance both the effectiveness and relevance of the learning process. As educational institutions continue to adapt to the demands of the 21st century, the role of technology in reconfiguring how students interact with historical knowledge has become increasingly central. Not only does digital technology allow for more dynamic and personalized learning experiences, but it also introduces possibilities for greater inclusivity, interactivity, and student autonomy in navigating historical content.

One of the most prominent advantages of using educational technology is the flexibility it offers through digital learning platforms, such as Google Classroom and Edmodo. These platforms enable students to access learning materials beyond the traditional constraints of time and space, providing them the autonomy to study at their own pace and according to their schedules (Malysheva et al., 2022; Rahmawati et al., 2020). This asynchronous learning model allows students to revisit materials, pause, and reflect on complex historical narratives, and engage with content in a more self-directed manner. Such flexibility supports differentiated learning pathways and can

accommodate students' diverse academic needs and learning preferences, particularly in subjects like history that often require reflective and critical engagement with sources and events. As Malysheva et al. (2022) assert, the ability to delve deeper into the material on a flexible timeline enhances comprehension and retention of historical knowledge.

Students participating in this study reported that this flexibility was especially helpful during thematic modules involving complex historical topics, such as Indonesia's independence movement or the Cold War. According to one student from SMA Negeri 3 Pontianak, "I could rewatch the video explanation about the 1948 Madiun Affair and finally understand the causes better." Another student from SMA Negeri 5 mentioned, "Doing the project about colonialism using Google Docs with my group made learning feel less boring and more like solving a mystery together." These reflections illustrate how autonomy and collaboration are fostered through digital platforms and how these tools reshape the affective dimension of learning history.

Beyond logistical flexibility, technology enriches history education through the use of multimedia and interactive tools that offer multisensory learning experiences. The incorporation of documentary videos, animated historical simulations, interactive timelines, and digital maps allows students to visualize and contextualize complex historical developments in ways that are not possible through text alone (Fitriningtiyas et al., 2019; Yildirim et al., 2018). These digital media tools provide tangible representations of historical phenomena, facilitating a more vivid and experiential understanding of events such as wars, revolutions, and socio-political transformations. Additionally, immersive technologies such as Virtual Reality (VR) offer students opportunities to virtually explore historical sites and artifacts, creating simulated field trips that can evoke emotional and intellectual engagement with the past. This immersive learning not only boosts motivation but also fosters empathy and a deeper sense of connection to historical events (Malysheva et al., 2022; Yildirim et al., 2018).

Observational data also confirmed that teachers most frequently incorporated these tools in units focusing on global conflicts, nationalism, and cultural heritage. However, in topics such as the development of early constitutional law or trade routes in pre-colonial Indonesia, the integration of technology was less intensive. Teachers cited the abstract nature of some themes as a constraint, suggesting that digital methods were most effective when aligned with visually rich or narrative-based content.

Another significant opportunity lies in the collaborative learning environments enabled by digital platforms. Technologies like Google Classroom facilitate student-centered activities that promote cooperation, idea exchange, and critical thinking. Students can collaborate on historical research projects, engage in peer review, and participate in group discussions, thereby developing their communication and teamwork skills —competencies that are increasingly emphasized in 21st-century education (Malysheva et al., 2022). These platforms not only encourage knowledge sharing but also enable inclusive participation by allowing more reserved students to contribute in written forums or asynchronous discussions. Teachers, in turn, benefit from the real-time monitoring capabilities of these platforms, which enable them to track student progress, provide timely feedback, and tailor instructional strategies to meet students' evolving needs and responses (Alenezi, 2023; Ni, 2023).

Furthermore, the application of technology in history education directly supports the cultivation of 21st-century skills, which include critical thinking, creativity, communication, and collaboration. By integrating technology into the history classroom, educators are not merely transferring knowledge about past events; they are equipping students with the cognitive and interpersonal tools necessary to interpret contemporary issues and future challenges with historical insight. Through research-based tasks, digital storytelling projects, and thematic discussions, students are

encouraged to think analytically, synthesize information from multiple sources, and articulate well-reasoned arguments. This pedagogical shift transforms history learning from a passive memorization exercise into an active process of inquiry, reflection, and civic engagement (Carretero et al., 2012; Thornhill-Miller et al., 2023).

One example observed in the field was the use of a digital poster project in SMA Negeri 1, in which students were asked to visualize the causes and consequences of the Reformation Era in Indonesia. This not only stimulated historical thinking but also promoted creative expression and peer evaluation. Such practices are indicative of a shift from content transmission to student-centered construction of historical understanding.

However, while these opportunities are promising, they do not exist in isolation from structural and pedagogical challenges. Several studies have highlighted that limitations in infrastructure, including inadequate access to devices and internet connectivity, as well as gaps in teacher training, continue to hinder the optimal use of technology in classrooms (Oyewale et al., 2021). These findings underscore the need for comprehensive and forward-looking educational policies that go beyond the mere provision of digital tools. What is required is a systemic approach that addresses infrastructural disparities, ensures equitable access to digital resources, and empowers teachers through continuous professional development focused on the effective integration of technology in subject-specific pedagogy.

Compared to previous studies, this research adds new value by triangulating data from students, teachers, and document analysis across multiple school settings in Pontianak. While earlier works have emphasized either teacher perspectives or general educational outcomes, this study uniquely captures student sentiments about the affective and motivational aspects of digital history learning. These findings enhance our understanding of how localized digital strategies influence learning experiences in Indonesian secondary education.

In light of these considerations, it becomes evident that technology, when thoughtfully and strategically integrated, can transform history education into a more flexible, interactive, and future-oriented discipline. By leveraging digital tools, educators can create richer learning environments that not only convey historical knowledge but also cultivate skills essential in the digital age. The potential of technology to personalize learning, encourage collaboration, and promote critical engagement with history is substantial. Yet, to fully realize this potential, it is crucial to establish a strong synergy among school leadership, teacher readiness, infrastructure development, and policy support.

Ultimately, the use of technology in history education is not merely a response to changing times, it is a proactive strategy to ensure that history remains a living, relevant, and empowering subject. With the right support structures in place, digital tools can help shape a generation of learners who are historically informed, technologically literate, and socially responsible, prepared not only to understand the past but to navigate and contribute to the complex world of the future (Porter & Detampel, 1995).

Conclusion

The implementation of digital technology in history education in secondary schools in Pontianak has had a positive impact on student engagement, enhancing their understanding and interaction with historical content. The use of digital tools such as documentary videos, historical simulations, and digital learning platforms has successfully created a more interactive and flexible learning experience, enabling students to learn independently and in greater depth. However, the main challenges faced include limitations in technological infrastructure, a lack of digital skills among

both teachers and students, and unequal access to devices and reliable internet connections. Despite these challenges, there are significant opportunities to maximize digital history education, particularly through the use of technologies such as virtual reality (VR) and augmented reality (AR), which can provide students with more immersive and contextualized experiences.

Based on the findings of this study, several recommendations are proposed to improve the effectiveness and inclusivity of digital-based history education. First, educational stakeholders must prioritize the strengthening of digital infrastructure in schools, particularly in underserved areas, to ensure equitable access to learning resources. Second, it is imperative to provide structured and ongoing professional development for teachers, focusing not only on technical proficiency but also on pedagogical strategies for integrating technology meaningfully into history instruction. Third, the curriculum should be redesigned to incorporate digital tools across diverse historical themes, allowing for their use not only in visually rich topics but also in abstract and conceptual discussions. Fourth, schools should adopt student-centered learning models such as project-based and inquiry-driven approaches that utilize technology to foster critical thinking, collaboration, and historical empathy. Lastly, policy reforms are needed to support digital inclusion, including device subsidies, expanded internet access, and digital literacy programs for both students and educators.

These recommendations aim to ensure that the integration of technology into history education is not only technically feasible but also pedagogically transformative, enabling students to become informed and digitally literate citizens with a historical perspective.

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