

UTILIZATION OF DIGITAL TECHNOLOGY IN HISTORY LEARNING WITH THE DEEP LEARNING APPROACH AT SMA NEGERI 2 BITUNG

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ABSTRACT

This study investigates the integration of digital technology into history learning through a deep learning approach at SMA Negeri 2 Bitung, with particular attention to its contribution to meaningful learning and students' historical thinking. Employing a qualitative case study design, data were generated through observations, interviews, and documentation. Analyzed through data condensation, data display, and conclusion drawing. The findings indicate that digital technology has been integrated through LCD projectors, laptops, mobile phones, and smart TVs. However, its integration remains predominantly at the substitution level of the SAMR model, indicating that technology replaces conventional learning tools rather than transforming learning processes. This condition limits the potential of digital technology to support deep learning, particularly meaningful engagement, contextual understanding, and reflective learning, despite efforts to strengthen teachers' competencies through professional development. Implementation is influenced by infrastructural and pedagogical constraints, including unstable electricity and internet connectivity, limited access to devices, and varying levels of teacher readiness. Teachers address these challenges by adapting resources, such as personal devices and offline materials, and adjusting technology use to classroom conditions. Despite these limitations, digital technology contributes to students' historical thinking by facilitating interpretation, causal analysis, multiperspectivity, historical reflection, and a shift from memorizing facts toward constructing historical meaning. These findings demonstrate that the educational value of digital technology depends not merely on availability, but on how teachers integrate it into meaningful, contextual, and reflective historical learning. Thus, digital technology functions as an enabling condition, not a sufficient condition, for the development of students' historical thinking skills.

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INTRODUCTION

The development of science and technology demands that all parties be competent to adapt to ongoing changes. The industry 4.0 era has brought disruptive phenomena to various aspects of life, including education (Faruq, 2020). In education, technology has developed into an important tool for accessing and disseminating information rapidly and efficiently. Information technology systems provide broad opportunities for the distribution of educational information across geographical boundaries and continue to develop alongside advances in communication technology that support learning activities (Magdalena et al., 2021; Syauqani, 2023).

The use of educational technology has also become an important strategy for addressing contemporary educational challenges. (Nurfritria & Melany, 2024) explain that educational development is essential for improving the quality of human resources and can be supported through educational technology as a systematic means of addressing problems in education and learning. In Indonesia, the development of science and technology has increasingly influenced educational practices and contributed to changes in the learning process (Anindyawati, 2024). Thus, the integration of technology into education is not merely related to the availability of technological devices but also to how technology is utilized to support meaningful and effective learning.

In history learning, digital technology provides opportunities to expand students' access to historical sources beyond conventional textbooks. The internet, digital learning platforms, multimedia, and other digital resources can provide students with diverse historical information and support learning activities that are more relevant to contemporary learners (Sumarudin & Khaeruddin, 2025). Documentary videos, historical simulations, and virtual reality applications can further provide visual and contextual representations of historical events, allowing students to develop a deeper understanding of historical contexts (Hafiz, 2023). At the classroom level, technologies such as LCD projectors, laptops, and smartphones can be utilized to present historical materials through images, videos, digital texts, and other multimedia resources. Such utilization can make historical content more accessible and engaging for students (Pendra et al., 2024; Putri, 2024).

However, the presence of technology alone does not necessarily result in meaningful or deep learning. The transformation of learning requires an approach that enables students to actively construct knowledge, connect concepts with real-life contexts, develop higher-order thinking, and engage in conscious, meaningful, and enjoyable learning. One approach relevant to these demands is the deep learning approach. This approach emphasizes learning that is meaningful, mindful, and enjoyable while encouraging higher-order thinking, knowledge application, and contextual understanding. In the context of 21st-century learning, deep learning is increasingly associated with the development of critical thinking, creativity, and problem-solving skills (Suyanto & Penyusun, 2025).

The application of deep learning in history education provides opportunities to transform historical learning from an emphasis on memorization toward interpretation, analysis, contextualization, and reflection. (Fatmawati, 2025) explains that deep learning in history can create more interactive and contextual learning experiences, encourage critical thinking, and enable students to connect historical events with contemporary social phenomena. Similarly, (Nurjanah & Suryadi, 2025) indicate that deep learning in history can be implemented through classroom discussions, historical case studies, and reflective assignments, supported by curriculum flexibility and institutional support.

These learning processes are closely related to the development of historical thinking. History learning can contribute to students' deeper understanding, critical thinking, and ability to relate historical knowledge to everyday life (Afwan et al., 2025). This perspective is consistent with (Wineburg, 2006), who emphasizes that historical thinking is not an automatic or natural process but a competency that must be developed through critical engagement with historical evidence and interpretation. Therefore, history learning should provide opportunities for students not merely to remember chronological events but also to examine cause-and-effect relationships, consider multiple perspectives, interpret historical sources, and reflect on the relevance of the past to contemporary life (Fitroh, 2025).

However, empirical conditions at SMA Negeri 2 Bitung indicate a gap between the ideal utilization of digital technology and its actual implementation in history learning. Based on preliminary observations and interviews with teachers and students, digital technology has been utilized through LCD projectors, laptops, smartphones, and online resources. However, its use remains largely technical and procedural, particularly for displaying presentation slides and videos and accessing additional historical information through the internet. Although such utilization provides variation and reduces

students' learning boredom, technology has not been consistently developed as a pedagogical resource for inquiry, analysis, reflection, and contextual learning.

The gap is also evident in the implementation of deep learning. Although history teachers have received training related to the deep learning approach, its implementation in classroom practice remains varied. In some learning situations, teacher involvement as facilitator, guide, and provider of feedback is not yet consistent, while learning activities may still emphasize task completion and the transmission of information. Consequently, the availability of digital technology has not always been accompanied by pedagogical practices that support meaningful, mindful, and intellectually challenging learning. This indicates that the issue is not merely the availability of technological facilities but also how technology is integrated with pedagogical practices and the principles of deep learning.

Previous studies have shown that the integration of digital technology in learning can support the quality of history education and facilitate access to information. (Baruadi et al., 2024), found that the use of information technology can enhance student engagement through multimedia, personalized learning, and interactive activities in history education. (Syauqani, 2023) demonstrated that technology-based media can increase the attractiveness of history learning by presenting more concrete visualizations of prehistoric humans, kingdom relics, and historical figures. On the other hand, research on deep learning has also shown promising results. (Fatmawati, 2025) explained that the integration of deep learning in history education can make the material more contextual and relevant to students' lives, while (Nurjanah & Suryadi, 2025) showed that teachers possess relatively strong conceptual readiness to implement the deep learning approach through discussion strategies, case studies, and reflective assignments to develop students' higher-order thinking skills.

Furthermore, previous studies have not sufficiently explained the relationship between the use of digital technology within deep learning and the development of historical thinking. In particular, limited attention has been given to how technology-supported learning activities can provide opportunities for students to interpret historical information, analyze cause-and-effect relationships, understand multiple perspectives, and reflect on the relevance of historical events. Therefore, a research gap remains concerning the pedagogical process connecting digital technology utilization, the implementation of deep learning, and the development of historical thinking in history education.

This gap is particularly relevant in the context of SMA Negeri 2 Bitung. Digital technologies such as LCD projectors, laptops, smartphones, and internet-based resources have been utilized in history learning, but their use tends to remain technical and procedural. At the same time, although history teachers have received training on the *deep learning* approach, its implementation in classroom practice remains varied, particularly in terms of teacher involvement as facilitators and the development of activities that encourage inquiry, analysis, discussion, and reflection. These conditions indicate a gap between the potential of digital technology to support deep learning and its actual utilization in history learning, thereby requiring an empirical examination of the process.

Based on this research gap, the novelty of this study lies in its integrated analysis of digital technology utilization in history learning through a deep learning approach and its relationship to the development of students' historical thinking. This study does not merely identify the technologies being used or describe their benefits for learning, but examines how these technologies are utilized within the pedagogical process, how their use reflects the principles of deep learning, and how this process provides opportunities for the development of students' historical thinking skills. More specifically, this study examines three interconnected dimensions: (1) the forms and functions of digital technology utilization in history learning, (2) the extent to which such utilization corresponds to the principles of deep learning, and (3) its implications for the development of historical thinking. Thus, digital technology is not positioned merely as a device or learning medium but is analyzed in terms of its pedagogical function in encouraging students to understand, analyze, interpret, connect, and reflect on historical knowledge.

The novelty of this study also lies in revealing the dynamics and challenges of this integration within the actual classroom context at SMA Negeri 2 Bitung. The study considers how teacher practices, student engagement, technological availability, internet conditions, and supporting and inhibiting factors influence the integration of digital technology with deep learning. Accordingly, this study provides empirical understanding of not only whether technology is used, but how it is used in history learning, for what pedagogical purposes, to what extent its use supports deep learning, and how this process contributes to the development of historical thinking.

Based on the background, research gap, and novelty described above, this study addresses the following research question: How is digital technology utilized in history learning through a deep learning approach at SMA Negeri 2 Bitung, and how does its implementation contribute to the development of students' historical thinking?

In line with the research question, this study investigates how digital technology is utilized in history learning through a deep learning approach at SMA Negeri 2 Bitung. It also seeks to examine how the pedagogical integration of digital technology contributes to the development of students' historical thinking, particularly their ability to interpret historical information, analyze cause-and-effect relationships, understand multiple perspectives, contextualize historical events, and reflect on their relevance to contemporary life.

METHOD

This research employed a qualitative method with a case study design. Qualitative research aims to understand phenomena experienced by research subjects, such as behavior, perceptions, motivations, actions, and so on, holistically and through descriptive language in a specific, natural context, utilizing various natural methods (Moleong, 2022). Qualitative research was chosen because it aimed to deeply understand the phenomenon of integrating digital technology and deep learning approaches in the context of history learning at SMA Negeri 2 Bitung. A case study design is used to examine a phenomenon in depth within a specific context (Creswell, 2019). The case study unit in this research is the integration of digital technology and deep learning approaches in history learning at SMA Negeri 2 Bitung.

Data collection was conducted through observation, interviews, and documentation. Observations were conducted within the SMA Negeri 2 Bitung school environment regarding various activities within the school, including school leaders, teachers, students, and classroom learning processes. Interviews were conducted with four history teachers, one school leader in the curriculum field, and two students, with the aim of corroborating and enriching the data obtained through observation. Furthermore, observations of the school environment were also conducted to determine the school's facilities and infrastructure. Interviews were conducted with the principal, subject teachers, and students. Interviews were conducted to strengthen the data gathered during observations. Finally, documentation was used. To obtain data related to the history learning process, official school documents, such as the school profile, were required. In addition, documents from teachers, such as learning materials, were also required. Documents can be written, drawn, or even monumental works.

Data analysis was conducted through the stages of data condensation, data presentation, and conclusion drawing. Data condensation began with establishing the research focus, namely the use of technology in history learning using a deep learning approach at SMA Negeri 2 Bitung, including supporting and inhibiting factors, as well as student responses. During field data collection, the researcher selected and focused data obtained from observations, interviews, and documentation. The next step was data presentation. Data presentation is an organized and concise collection of information that allows for conclusions and action. In this study, the author presents the data comprehensively, beginning with an explanation of the research location conditions, including the profile of SMA Negeri 2 Bitung and the availability of supporting learning facilities and infrastructure. Next, the author presents an overview of the history learning process in the classroom, including learning methods, media used, and the use of technology in history learning using a deep learning approach.

The third step is drawing conclusions and verifying them. Researchers interpret data by examining patterns, trends, and causal relationships emerging from observations, interviews, and documentation related to the use of technology in history learning. Initial conclusions are not immediately finalized but are continually verified through reviewing field notes, comparing data from various sources, and discussions with supervisors to reach intersubjective consensus. Furthermore, researchers compare research findings with relevant theories and previous research findings. Through this verification process, researchers ensure that the conclusions they draw are valid, robust, and legitimized, and therefore accountable.

RESULT AND DISCUSSION

Result

Digital Technology in History Learning at SMA Negeri 2 Bitung

The utilization of digital technology at SMA Negeri 2 Bitung has been integrated into history learning through various forms, including the use of LCD projectors, laptops, Google, audiovisual media, PowerPoint, Canva, and coding for the development of teaching materials by teachers. Teachers at SMA Negeri 2 Bitung, including history teachers, have participated in training on the use of digital technology, which is not limited to basic applications but also encompasses the development of digital teaching materials. This support is reflected in the training programs provided to teachers to enhance their capacity to utilize technology in the learning process. As stated by Mr. Fredi: "The school has made considerable efforts, particularly through training on how to utilize technology, starting from simple applications. Previously, we only used PowerPoint, but now we use Canva. We have also started using coding to design teaching materials."

This statement indicates that the school has demonstrated a strong commitment to supporting the transformation of digitally based learning. Technology is no longer understood merely as a basic instructional aid but has become part of the school's strategy to improve the quality of learning. In the context of history learning, this support is particularly important because history education requires media that can help students understand historical events in contextual, visual, and reflective ways.

The interview findings further indicate that, in technology-based history learning, the teacher's role is no longer limited to that of an information provider but has expanded to include the roles of mentor and facilitator throughout the learning process. Teachers are responsible for ensuring that technology is used appropriately to support the achievement of learning objectives while guiding students to remain focused on learning activities. Ms. Kristina explained: "I serve as a companion for device users, ensuring the safety of the content displayed and balancing screen time with interaction among students. In addition, I also act as an educator and guide or mentor, supervising students when they use mobile phones, for example. I also serve as a facilitator." This statement is consistent with the deep learning approach, in which teachers function as facilitators who provide guidance and assistance to students in utilizing technology to independently search for historical materials and information. Teachers are no longer the sole source of knowledge; rather, they assist students in discovering and constructing their own knowledge through the various digital learning resources available.

Implementation of Deep Learning in History Learning

Based on the findings of interviews conducted with history teachers, it was found that the history teachers had a basic understanding of the deep learning approach as learning oriented toward in-depth understanding rather than merely memorizing subject matter. The history teachers interpreted deep learning as an effort to encourage students to understand the meaning of historical events more deeply and to connect them with real-life contexts. As expressed by Ms. Kristina regarding her understanding of deep learning: "In my opinion, deep learning is a new learning method that places greater emphasis on in-depth learning, meaning that students are able to understand a historical event deeply rather than simply memorizing it." A similar view was expressed by Ms. Nortje, who stated: "In my opinion, deep learning is an approach to learning that enables students to gain a deeper understanding of the material being taught." The interviews with these two teachers indicate that the teachers had understood the essence of deep learning as an approach that emphasizes students' in-depth understanding of the historical material they study.

Nevertheless, the level of teachers' understanding varied, despite having received training and information from fellow teachers. This was evident from Ms. Ryya acknowledgment that she had not yet fully understood the approach. Another finding of this study indicates that the history teachers had attempted to design history learning that was not solely oriented toward memorizing important figures involved in historical events or memorizing significant dates. Instead, they had designed history learning activities that encouraged students to connect historical events with contemporary life.

This is reflected in Ms. Kristina explanation: "I design history learning to be as engaging as possible by organizing museum visits, presenting documentary videos, and conducting active discussions with students. Through this design, students are able to analyze historical events so that they can relate those events to their present-day lives." Ms. Nortje also emphasized that the learning activities she designed were oriented toward discussions that connected historical events with the students' current life contexts. Ms. Nortje stated: "I engage them in discussions about various topics, for example, a particular historical event, and then I ask the students what they think if the event occurred in the present and what impact it would have on their lives." In addition to encouraging students to connect historical events with real-life contexts, the teachers also designed engaging learning activities to promote active student participation, as stated by Mr. Tenny: "When I conduct

a history debate, the students are divided into several groups, and everyone has to participate, for example, in preparing a historical script to be debated.” Through these activities, students were encouraged to develop critical thinking skills, articulate arguments, and defend their perspectives based on historical evidence and facts. Such activities are consistent with the principles of deep learning, which emphasize students’ active engagement in the learning process.

Supporting Factors

The supporting factors include school policies and the availability of technological facilities, such as LCD projectors and smart TVs, which have contributed positively to the implementation of digital technology in history learning. An interview with the Vice Principal for Curriculum, Mr. Fredy, revealed that SMA Negeri 2 Bitung has provided LCD projectors and smart TVs, as well as designated spaces for LCD projectors in every classroom. Mr. Fredy further explained: “At SMA Negeri 2 Bitung, LCD projectors and smart TVs are available for use by students, and they are also available in the computer laboratory. Each classroom has also been provided with a designated place for an LCD projector.” In addition to technological support, SMA Negeri 2 Bitung has established a standardized assessment system to support the implementation of deep learning. Mr. Fredy explained that assessment formats are available, covering grade processing, learning objectives, and final assessments. He further stated: “There are already regulations regarding the assessment system. From grade processing and learning objectives to various assessments, including the final assessment, the formats are already available. Therefore, teachers only need to implement the formats provided by the school.”

The deep learning approach has begun to be implemented by history teachers at SMA Negeri 2 Bitung. This implementation is supported by training provided to teachers. The Vice Principal for Curriculum, Mr. Fredy, explained that teachers had received training on the deep learning approach, including the preparation of lesson plans aligned with deep learning. He further stated: “If asked how far it has been implemented, in my opinion, it has been consistent because it is based on the Ministry of Primary and Secondary Education Regulation. Thus, teachers have started incorporating the deep learning approach into their lesson planning, and they have also received training on this approach conducted by BGTK of North Sulawesi Province.” Mr. Fredy’s statement indicates that the implementation of the deep learning approach at SMA Negeri 2 Bitung has received support through school policies. In this regard, deep learning has not merely been introduced as a new concept in learning but has also been integrated into the lesson planning prepared by teachers.

Inhibiting Factors

Based on the observation results, the researcher identified several obstacles in the utilization of digital technology and the implementation of deep learning at SMA Negeri 2 Bitung. These obstacles were primarily related to internet connectivity, device availability, technical support, and the readiness of both teachers and students. Mr. Tenny stated that some classrooms have electricity and that the school also provides Wi-Fi access for students. However, the most frequently encountered obstacle is poor internet connectivity. Mr. Tenny further explained that the successful utilization of technology depends heavily on the availability of school-provided internet, particularly because some students do not have sufficient internet data or have limited economic resources. Mr. Tenny stated: “The most frequent problem is poor internet connectivity. In addition, there are internal factors, such as the provision of internet or Wi-Fi services by the school. Without Wi-Fi provided by the school, it would certainly be somewhat difficult.” Meanwhile, Ms. Kristina explained that the obstacles she encountered included the absence of technical staff to assist her in preparing the LCD projector, limited resources, inadequate internet connectivity, and the fact that some students did not have mobile phones. Ms. Kristina stated: “When I utilize digital technology, I certainly encounter several obstacles, such as the absence of technicians to help me prepare the LCD projector, limited resources, inadequate internet connectivity, and some students in the class do not have mobile phones, which makes it difficult for history learning using this technology to run effectively.”

A similar obstacle was experienced by Ms. Nortje, namely poor internet connectivity. Ms. NP stated: “The most frequent problem is poor internet connectivity.” Meanwhile, Ms. Ryya explained that the obstacles were related to limited facilities and students running out of internet data. Ms. Ryya stated: “I experience difficulties with internet connectivity, limited facilities such as LCD projectors or smart TVs available in the computer laboratory, some classrooms do not have electricity, and most frequently, students run out of internet data.”

These obstacles were not experienced only by teachers; students also encountered similar difficulties. The findings indicate that students experienced limited access to digital devices and internet connectivity. Not all students had adequate

digital devices or internet connections to support the learning process. This condition created difficulties for some students in accessing learning materials, participating in learning activities, and engaging actively in the classroom. Consequently, the use of digital technology has the potential to create learning disparities among students, particularly those from economically disadvantaged families or those living in environments with unstable internet access. Interviews with several students at SMA Negeri 2 Bitung, particularly from the observed classes, revealed that one of the main obstacles was the limited availability of school facilities and infrastructure. Students reported that their classrooms did not fully support the use of technology because there was no electricity. Chiyo stated: "There is no electricity in our classroom, so if we want to use the LCD projector, we have to go to the computer laboratory." A student from another class, Sena, expressed a similar experience, stating that when they wanted to give presentations, they had to go to the computer laboratory because their classroom had no electricity. Sena stated: "No, because there is no electricity. So, if we want to give a presentation, we have to go to the computer laboratory." The statements from Chiyo and Sena indicate that the utilization of digital technology in history learning continues to face challenges related to school facilities and infrastructure.

From the perspective of school policy, Mr. Fredy, as the Vice Principal for Curriculum, also acknowledged challenges related to teacher readiness, particularly among senior teachers. Mr. Fredy explained: "Teachers under the age of 40 will certainly master the technology being used more quickly, but teachers aged 50 and above require assistance." Mr. Fredy also emphasized that the deep learning approach requires time to be fully understood because it is a new policy. He further stated: "Because this is only the first year, it takes time to understand the concept of deep learning, so teachers need time to try to integrate this approach into their classrooms." Based on Mr. Fredy's statement, the implementation of the deep learning approach in learning can be analyzed as still being in an adaptation stage because it is a relatively new policy. This condition indicates that teachers have not yet fully developed the conceptual understanding and practical experience required to integrate the principles of deep learning into the learning process. Therefore, time is an important factor in supporting the internalization of the concept, adaptation of teaching strategies, and development of teacher competencies so that the approach can be implemented effectively.

Strategies for Overcoming the Obstacles

To overcome obstacles in the utilization of digital technology and the implementation of deep learning in history learning, teachers generally use mobile phones for presentations or their personal laptops without relying on LCD projectors to display images or videos. One of the history teachers, Ms. Ryra, also prepared an LCD projector independently. To address internet connectivity problems, history teachers generally refresh their mobile phones or wait until the network connection improves before downloading videos or images to be shared with or displayed to students. For students who run out of internet data, they usually request a hotspot from their classmates or from the teacher conducting the lesson at the time.

Implications of Digital Technology Utilization for the Development of Students' Historical Thinking

The findings indicate that the utilization of digital technology in history learning at SMA Negeri 2 Bitung is closely related to the implementation of deep learning and the development of students' historical thinking. Technologies such as smartphones, the internet, documentary videos, and visual media do not automatically produce deep learning; rather, they function as resources through which teachers can create learning experiences that require students to understand, apply, and reflect upon historical knowledge. In this context, deep learning serves as a pedagogical orientation that transforms technology from a means of information delivery into a medium for developing historical reasoning. This is consistent with the principles of deep learning, which emphasize meaningful, contextual, and reflective learning experiences.

This integration is evident in several classroom activities. The use of the Proclamation text, documentary videos, and digital sources encouraged students to read, analyze, and compare historical information. These activities demonstrate processes of source interpretation and indicate a shift from the passive reception of facts toward the construction of historical understanding. In learning about nationalism, students were not merely asked to identify the factors underlying the national movement but were encouraged to explain the relationships among political, social, and educational factors and their consequences for subsequent social development. This activity demonstrates causal reasoning as an important component of historical thinking.

A similar process can be observed in the development of historical multiperspectivity. In learning about theories of the arrival of Hinduism and Buddhism in Indonesia, students selected a particular theory and justified their choice, while in

the national awakening debate, they defended their arguments and responded to opposing perspectives. These activities indicate that students were not merely acquiring information but using it to consider evidence, construct arguments, and engage with different perspectives. Within Wineburg's (2006) framework, such processes are related to corroboration, through which information is compared to develop a more critical historical understanding. Meanwhile, storytelling concerning local Minahasan history and questions regarding the significance of the Youth Pledge encouraged students to connect the past with their present lives, indicating the development of historical reflection.

Thus, deep learning in this study can be understood as the pedagogical condition through which digital technology contributes to historical thinking. The depth of learning depends not on technological sophistication but on the cognitive demands embedded in its use: when technology is employed to search for and compare sources, analyze causal relationships, consider different perspectives, and construct arguments, its use reflects deep learning while simultaneously supporting historical thinking. Conversely, when technology is used merely to search for and reproduce information, its contribution to both dimensions remains limited.

These findings indicate that the relationship among digital technology, deep learning, and historical thinking is fundamentally pedagogical rather than technological. Technology provides access to historical sources, deep learning orients students toward understanding and reflection, and historical thinking determines how they critically process the past. Teachers therefore play a central role in integrating these dimensions through questions and activities that require interpreting sources, analyzing causation, considering multiple perspectives, and constructing evidence-based arguments. Although indications of historical thinking were identified, their development remains suboptimal, as critical evaluation of source credibility, bias, and context has not yet been applied consistently.

Discussion

The use of digital technology at SMA Negeri 2 Bitung generally remains at the substitution stage of the SAMR model: technology replaces conventional media such as whiteboards and printed textbooks without changing the teacher centered structure of instruction, as seen in the use of mobile phones, which is still limited to distributing materials through WhatsApp, so that what changes is merely the delivery channel rather than the cognitive demands placed on students (Cáceres-Nakiche et al., 2024). This tendency is consistent with the perception that history learning is often considered boring due to the dominance of conventional methods, which in turn pushes schools to adopt digital media without redesigning the tasks involved (Hidayatullah et al., 2026), so that the mere presence of technology does not automatically raise the SAMR stage unless the tasks assigned are redesigned. An even greater risk emerges when audiovisual material is used uncritically, since this can hinder rather than support historical thinking if it replaces source analysis and leads students to treat prepackaged narratives as final facts (Gupta, 2025), in other words, the contribution of technology to the quality of learning ultimately remains determined by teachers' pedagogical capacity rather than by the technology itself (Nastiti et al., 2024; Pendra et al., 2024).

Amid these constraints, teachers' basic understanding of deep learning nevertheless shows a shift in orientation from rote memorization toward meaning making, consistent with the view that historical thinking is a competency that must be deliberately cultivated rather than a disposition that emerges naturally (Wineburg, 2006). This shift is evident, for instance, when the lesson on the Youth Pledge no longer stops at memorizing the text but also requires students to make sense of its relevance to the present (Ibagón Martín, 2023), and it becomes more effective when grounded in concrete entry points such as local cultural practices rather than treated as an abstract instructional label (Putra Yasa et al., 2025), as seen in the learning unit on the Japanese occupation, which was designed around the principles of mindful, meaningful, and joyful learning, even though its implementation is not yet evenly distributed across classes.

The extent to which this potential can be more broadly realized, however, depends heavily on the surrounding institutional conditions. Institutional support in the form of BGTK training, school Wi Fi networks, and electricity supply creates opportunities for technology-based learning, but these opportunities are constrained by limited or damaged devices, unstable power supply, and a generational digital literacy gap among teachers (Aulia et al., 2024; Jufri, 2024). The generational dimension of this gap is reinforced by findings that younger teachers tend to adapt more easily to digital devices, while senior teachers more often face barriers related to confidence, and that leadership grounded in empathy, collaboration, and sustained learning proves more effective in narrowing this gap than one off training sessions (Kurniady et al., 2026),

inadequate classroom conditions further affect students' concentration (Margaretta, 2026), while the effectiveness of such support ultimately also depends on the principal's role as instructional leader in ensuring that institutional support actually reaches classroom practice (Ardi, 2025).

Unlike infrastructural and generational barriers, which can in principle be narrowed through investment and mentoring, issues of teacher professionalism and discipline, including repeated absences, attending to personal matters during teaching hours, and the absence of lesson plans, are non-technological in nature and relate directly to teachers' obligation to plan, implement, and evaluate instruction as mandated by Law Number 14 of 2005 on Teachers and Lecturers, thereby requiring mechanisms of supervision and accountability rather than merely the provision of devices. A similar tension appears in the school's policy trial banning student mobile phone use for two weeks, which, while a reasonable child safety measure, simultaneously removed the device most widely used by students for independent historical research, illustrating a genuine trade off between digital safety governance and the goals of digital pedagogy rather than a failure on either side.

Faced with these constraints, teachers and students have not entirely abandoned technology-based learning but have instead developed adaptive strategies, including the use of personal devices, downloading materials in advance, and a supervised compromise on mobile phone use. Theoretically more interesting is the emergence of deliberate nontechnological strategies, such as oral storytelling of local Minahasan history, structured historical debates, museum visits, and the use of concrete objects such as nutmeg, which generated comparable, and on some occasions even greater, enthusiasm than technology-based learning. This finding extends the enabling but not sufficient thesis in the opposite direction: just as the presence of technology does not guarantee the emergence of historical thinking, its absence does not prevent historical thinking either, so long as teachers replace it with an equally deliberate pedagogical strategy, meaning that digital technology and nontechnological strategies can be understood as partially interchangeable enabling conditions, with teachers' pedagogical design serving as the constant requirement underlying both.

This constancy is most evident when the five manifestations of students' historical thinking identified in this study are examined together. Activities centered on the text of the Proclamation of Independence reflect Wineburg's sourcing heuristic by treating the document as an artifact with an author that can be interpreted, a point reinforced by findings that carefully designed writing prompts requiring students to synthesize and evaluate sources are more effective at eliciting historical thinking than relying on mere exposure to sources (Steiss et al., 2024). In the material on nationalism, the shift in questioning from causal factors toward the relationships among factors operationalizes Wineburg's view that causal reasoning in history is relational rather than enumerative (Wineburg, 2006), while debates on the theories of Hindu Buddhist entry and on national awakening reflect the corroboration heuristic, consistent with findings that exposure to multiple perspectives contributes to richer historical understanding (Bedford & Barnes, 2024; Kropman et al., 2023), although it should be noted that even trained pre service history teachers tend to produce single perspective, textbook like narratives when handling controversial historical events, indicating that multiperspectivity is a demanding disciplinary skill that does not develop automatically (Rantala, 2026). Oral storytelling of Minahasan history, meanwhile, brings to life the premise that the past acquires meaning only insofar as it is connected to the present, although reflection still depends on the reflective questions posed by the teacher rather than merely on emotional or geographic proximity to the material (Wineburg, 2006). Across all these manifestations, the recurring determining factor is not the topic or the medium of instruction but the design of questions and task structures that require every student, not just a group representative, to take and defend a position.

Taken together, these findings ultimately affirm that digital technology and the discourse of deep learning are a necessary but not sufficient condition for historical thinking, since the depth of historical thinking achieved is determined by teachers' questioning practices and pedagogical design rather than by the instructional medium used. Theoretically, this study strengthens the SAMR model by empirically showing that technology use can remain at the substitution stage even when infrastructure and training are adequate, since progression to higher SAMR stages is determined by teachers' pedagogical readiness rather than by access alone (Cáceres-Nakiche et al., 2024), while also extending Wineburg's (2006) framework to the context of a senior high school in Indonesia grounded in local history, and refining the enabling but not sufficient thesis by proposing that technological and nontechnological strategies function as parallel, partially interchangeable enabling conditions, with the questions and task structures designed by teachers serving as the absolute condition that converts either strategy into historical thinking.

This theoretical implication translates directly into classroom practice: teachers can begin shifting fact recall questions toward questions of meaning and connection even before infrastructure improves, require every student rather than only a group representative to take and defend a position in debates, and draw on local wisdom and nontechnological methods as effective, low cost means of reflection when devices, electricity, or connectivity are unavailable (Putra Yasa et al., 2025; Steiss et al., 2024). At the institutional level, these findings suggest that schools and BGTK need to shift training away from one off sessions toward sustained, empathy based collegial mentoring, particularly for senior teachers (Kurniady et al., 2026), while also strengthening supervisory mechanisms for lesson plan preparation and teaching attendance as a form of professional accountability under Law Number 14 of 2005, and maintaining a supervised model of mobile phone use as a middle ground between the mandate of child digital safety and the preservation of technology based inquiry.

Looking ahead, these findings open avenues for comparative research across schools with varying levels of infrastructure and teacher professionalism to examine whether particular SAMR stages correspond to measurable historical thinking outcomes (Cáceres-Nakiche et al., 2024), research examining whether Indonesian students show a comparable gap between conceptual awareness and disciplinary performance in multiperspective writing (Rantala, 2026) and longitudinal research tracing the extent to which changes in students' historical thinking can be attributed to teachers' questioning strategies as opposed to other classroom factors.

CONCLUSION

This study finds that deep learning in history instruction at SMA Negeri 2 Bitung is shaped by the cognitive demands teachers deliberately design through their media and methods, rather than by engaging lessons or technology alone. This is evident when students interpret sources, explain cause and effect, argue amid diverse perspectives, and connect past events to present life, rather than merely memorizing or recalling information. Technology expands access and engagement, but depth of thinking still depends on teachers' pedagogical design.

Theoretically, the study strengthens the understanding of historical thinking by showing that teachers' pedagogical readiness matters more than infrastructure in shaping students' depth of thinking, while extending Wineburg's framework to an Indonesian senior high school context grounded in local history. Practically, it offers a model of questioning, task design, and local content such as oral history and debate to cultivate historical thinking despite limited infrastructure, and points school leadership and BGTK toward sustained mentoring rather than one-off training.

The study is limited by its single-school qualitative design, relying on interviews and observation without a quantitative measure of historical thinking outcomes. Future research should pursue comparative studies across schools with varying infrastructure and teacher professionalism, as well as longitudinal research tracing students' development in interpretation, causal reasoning, multiperspectivity, and reflection over a full academic year.

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