



Principals' Transformational Leadership in Fostering Digital Technology-Based Innovation in History Learning: A Multiple-Case Study

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ABSTRACT

This study explores how principals' transformational leadership supports digital technology-based innovation in history learning in Indonesian senior high schools. A qualitative multiple-case study was conducted in three schools in Bandung, West Java, involving 21 participants: three principals, six history teachers, and twelve students. Data were generated from semi-structured interviews, six non-participant classroom observations, and school documents collected between January and May 2024. A hybrid thematic analysis combined deductive codes derived from transformational leadership and technology-integration literature with inductive codes emerging from the data. Two researchers independently coded 20% of the dataset; the reported 87% value represents simple percent agreement, with disagreements resolved through discussion. Triangulation, member checking, peer debriefing, and an audit trail were used to strengthen trustworthiness. Four themes were identified: visionary digital leadership, stimulation of teacher creativity, cultivation of collaborative culture, and mobilization of resources and technical support. Cross-case comparison showed that the depth of innovation varied with teachers' prior competence, school resources, external support, and infrastructure. The observations also indicated that technology use was not uniformly transformative: virtual visits, primary-source analysis, and digital storytelling supported inquiry and creation, whereas gamified quizzes often remained at recall or comprehension levels. The findings therefore suggest an association between context-sensitive leadership practices and teachers' willingness and capacity to experiment, rather than a causal effect. An interpretive model is proposed to explain how leadership practices may operate through shared purpose, teacher confidence, peer learning, and reduced practical barriers under specific contextual conditions. Implications are offered for principal development and school-level implementation of the Merdeka Curriculum, while limiting transfer claims to comparable settings.



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INTRODUCTION

Digital technology has expanded the range of resources available for teaching and learning, but its educational value depends on pedagogical purpose, teacher preparation, equitable access, and institutional support. The UNESCO Global Education Monitoring Report cautions that technology is not inherently beneficial and that access, governance, and teacher preparation are system-level conditions for meaningful use (UNESCO, 2023). In Indonesia, the Merdeka Curriculum encourages flexible, learner-centered learning and provides schools with greater space to adapt instruction to local needs (Kemendikbudristek, 2022). Within this policy environment, school leaders are expected to translate broad reform aspirations into workable conditions for classroom practice.

History learning offers a particularly important context for examining this translation. Conventional instruction is often dominated by textbook exposition, chronological recall, and teacher explanation. Digital resources can broaden students' access to visual artifacts, digitized primary sources, virtual heritage sites, interactive timelines, and multimodal storytelling. When embedded in historical inquiry, these resources may support sourcing, contextualization, comparison of perspectives, interpretation, and the construction of evidence-based accounts

(Wineburg, 2001; Saye & Brush, 2002; Carroll, 2012; Miralles-Sanchez et al., 2023). However, the presence of technology does not guarantee disciplinary thinking. A digital quiz may reproduce factual recall, while a carefully designed primary-source task may support analysis and interpretation. The key issue is therefore not simply whether technology is used, but how schools create conditions for pedagogically meaningful use.

School leadership is one condition frequently associated with technology integration. Transformational leadership describes practices through which leaders articulate a shared purpose, model valued behavior, challenge established assumptions, and support individual development (Burns, 1978; Bass, 1985; Bass & Avolio, 1994). Research on school technology leadership similarly emphasizes digital vision, professional learning, organizational support, infrastructure, and a culture that encourages experimentation (Anderson & Dexter, 2005; Thannimalai & Raman, 2018; Hamzah et al., 2021; Karakose et al., 2021). Recent reviews indicate that digital leadership has become a broad field connecting educational change, technology adoption, professional development, and school improvement (Karakose et al., 2024; Sarimin et al., 2025).

Nevertheless, three limitations remain in the literature. First, many studies examine technology leadership at the school-wide level and report correlations between leadership and teachers' technology use, providing less detail about the day-to-day processes through which leadership is interpreted by teachers. Second, studies often focus on general technology adoption, crisis-driven online learning, or STEM-related contexts, while subject-specific pedagogical demands receive less attention. Third, research on digital history education typically concentrates on tools, learning designs, or historical-thinking outcomes, with limited analysis of the organizational and leadership conditions that support or constrain teachers' experimentation. Consequently, the relationship between principals' leadership practices and history-specific digital innovation remains insufficiently explained, particularly in Indonesian secondary schools.

This study addresses that gap through a qualitative multiple-case analysis of three senior high schools in Bandung. The purpose is not to test whether transformational leadership causes improvement, but to examine how principals, teachers, and students describe the processes through which leadership practices are connected to digital innovation in history learning, and how those processes vary across school contexts. The study is guided by three questions: (1) How do principals enact transformational leadership in support of digital innovation in history teaching? (2) What forms of digital technology-based innovation are implemented and observed in history lessons? and (3) What enabling conditions, constraints, and cross-case differences shape these practices?.

LITERATURE REVIEW

A. Transformational Leadership and Digital School Leadership

Transformational leadership is commonly represented through four interrelated dimensions: idealized influence, inspirational motivation, intellectual stimulation, and individualized consideration (Bass, 1985; Bass & Avolio, 1994). In schools, these dimensions are expressed when leaders model professional values, frame a compelling educational purpose, invite teachers to question routine practice, and provide differentiated support. Although transformational leadership is often associated with organizational commitment and change, its effects are not automatic. Leadership is enacted within institutional structures, professional histories, resource constraints, and local cultures; therefore, the same behavior may be interpreted differently across schools.

Digital leadership overlaps with transformational leadership but gives greater attention to technology-related vision, infrastructure, professional learning, digital citizenship, and organizational systems. Anderson and Dexter (2005) conceptualized school technology leadership as a combination of leadership activities, policies, and implementation decisions. Quantitative studies have reported relationships between principals' technology leadership, professional development, teacher self-efficacy, and classroom integration (Thannimalai & Raman, 2018; Hamzah et al., 2021). Qualitative research has further shown that teachers value principals who model technology use, support professional development, and build a digital learning culture (Karakose et al., 2021). These findings establish leadership as relevant, but they do not by themselves show that leadership is the sole or direct cause of pedagogical change.

B. Digital Technology and Disciplinary History Learning

History education requires more than the acquisition of factual knowledge. Historical thinking includes attention to evidence, context, chronology, causation, continuity and change, perspective, and interpretation (Wineburg, 2001). Digital environments can support these practices by enabling students to examine digitized sources, navigate virtual museums, compare representations, create interactive timelines, and produce multimedia narratives. Case studies of technology-rich history instruction suggest that digital learning designs can support inquiry, problem solving, source evaluation, and the creation of new historical texts (Carroll, 2012). More recent work on history-class observation also

emphasizes the need to examine whether classroom activities actually make historical sources, multiple perspectives, and disciplinary reasoning visible (Miralles-Sanchez et al., 2023).

At the same time, technology can be used superficially. Presentation software may reproduce teacher-centered exposition, and gamified quizzes may increase participation without extending cognitive demand beyond recall. This distinction is central to the present study. Digital innovation is defined here as a change in instructional practice in which technology contributes to a new or substantially modified way of engaging students with historical content, evidence, representation, or collaboration. The analysis therefore considers both the form of technology and the historical-thinking demand of the activity.

C. Structured Synthesis and Research Gap

Table 1 summarizes the main literature streams used to position the study. The synthesis shows that leadership research and history-pedagogy research offer complementary insights but are rarely integrated at the level of subject-specific school practice.

Table 1. Structured synthesis of relevant literature and unresolved issues

Literature stream	Established insight	Unresolved issue addressed in this study
Transformational leadership	Vision, modelling, intellectual stimulation, and individualized support can orient organizational change.	How these practices are interpreted and enacted in relation to one school subject.
Digital/technology leadership	Vision, professional development, infrastructure, and digital culture are associated with teachers technology use.	How leadership processes interact with teacher competence, school resources, and external support across cases.
Digital history education	Virtual visits, digital sources, timelines, and storytelling can support inquiry and historical thinking.	Whether observed technology use moves beyond presentation or recall, and what school conditions support deeper use.
Indonesian policy context	The Merdeka Curriculum provides flexibility for learner-centered and contextualized instruction.	How school-level leadership translates broad policy expectations into local history-learning practices.

The study uses transformational leadership as a sensitizing framework rather than a causal model. Deductive categories guided initial attention, while inductive coding captured collaboration, resource brokering, barriers, school differences, and evidence that did not fit a simple success narrative. This approach allows the analysis to identify supportive processes and boundary conditions without assuming that leadership alone produced the observed practices.

METHOD

A. Design and Case Boundaries

A qualitative multiple-case study design was used to examine leadership and digital history learning within their real-life school contexts (Creswell, 2021). Each school constituted a bounded case. The unit of analysis was the set of leadership practices, teacher responses, classroom innovations, and contextual conditions related to digital technology use in history learning. Cross-case analysis was used to identify recurring patterns as well as differences and disconfirming evidence.

The study was conducted from January to May 2024 in three senior high schools in Bandung, West Java. The schools were selected purposively because supervisory documents indicated that they had attempted to integrate technology into history instruction. This information-oriented selection made the phenomenon observable, but it also introduced selection bias: the cases were more digitally active than schools with little or no technology use. The findings should therefore be transferred cautiously to comparable schools and should not be interpreted as representative of all Indonesian senior high schools.

Table 2. Contextual profile of the three cases

Case	School type and context	Pre-existing technology condition	Analytical implication
SMA N 1 Cendekia	High-performing public school; comparatively stronger financial base.	Existing reputation for innovation; access to tablets, virtual resources, and a school innovation fund.	Provides an information-rich case of relatively well-supported experimentation.
SMA N 2 Harmoni	Average-performing suburban public school with tighter resources.	Technology initiatives supported through workshops, refurbished	Shows how leadership support operates under

Case	School type and context	Pre-existing technology condition	Analytical implication
SMA S Pelita Bangsa	Private school with moderate resources and foundation oversight.	devices, and local infrastructure solutions. Use of lower-cost platforms and foundation-supported procurement.	moderate resource constraints. Highlights the influence of external governance and selective resource allocation.

B. Participants and Sampling Adequacy

Participants were selected because they had direct experience of leadership, history teaching, or technology-enhanced history lessons. The final sample comprised three principals, six history teachers, and twelve students, for a total of 21 participants. Rather than claiming universal thematic saturation from a fixed number, sampling adequacy was judged through information power: the study had a narrow aim, information-rich participants, multiple perspectives within each case, and triangulation across interviews, observations, and documents (Malterud et al., 2016). The sample supports an in-depth account of these cases but not statistical generalization.

Table 3. Participant demographics

Code	Role	Gender	Experience/g rade	Educational background	School
P1	Principal	Male	18	M.Pd. (Educational Management)	SMA N 1 Cendekia
P2	Principal	Female	12	M.Pd. (History Education)	SMA N 2 Harmoni
P3	Principal	Male	20	M.Pd. (Educational Leadership)	SMA S Pelita Bangsa
T1	History teacher	Female	15	S.Pd. (History)	SMA N 1 Cendekia
T2	History teacher	Male	8	S.Pd. (History)	SMA N 1 Cendekia
T3	History teacher	Female	10	S.Pd. (History)	SMA N 2 Harmoni
T4	History teacher	Female	22	S.Pd. (History)	SMA N 2 Harmoni
T5	History teacher	Male	6	S.Pd. (History)	SMA S Pelita Bangsa
T6	History teacher	Female	9	S.Pd. (History)	SMA S Pelita Bangsa
S1-S12	Students	Mixed	Grade 11-12	-	Across the three schools

C. Data Collection

Data were generated through semi-structured interviews, non-participant classroom observations, and document analysis. All interviews were audio-recorded with consent and transcribed verbatim. Principal interviews lasted approximately 60 minutes, teacher interviews 45-60 minutes, and student interviews approximately 30 minutes. The six classroom observations comprised two history lessons in each school. Because six observations cannot comprehensively represent routine practice, they were treated as corroborative snapshots that enabled comparison between reported leadership influence and visible classroom activity.

Table 4. Data collection matrix and instrument focus

Source	Coverage	Core domains/prompts	Analytical contribution
Principal interviews	3 interviews, about 60 minutes each	Digital vision for history; modelling; expectations; professional development; collaboration; resource decisions; barriers; examples of successful and unsuccessful initiatives.	Leadership intentions, actions, and perceived constraints.
Teacher interviews	6 interviews, 45-60 minutes each	Prior digital competence; perceived leadership influence; tools and learning designs; experimentation; support received; failed or limited attempts; cross-school conditions.	Teacher interpretation, agency, and alternative explanations.
Student interviews	12 interviews, about 30 minutes each	Experience of technology-enhanced lessons; participation; historical inquiry; comparison	Student perspective on classroom enactment and limitations.

Source	Coverage	Core domains/prompts	Analytical contribution
Classroom observations	6 lessons: 2 per school	with conventional lessons; distraction and access issues. Lesson goals; digital tool; teacher/student roles; use of sources and perspectives; inquiry; cognitive demand; collaboration; technical disruptions.	Direct but bounded evidence of pedagogical practice.
Documents	Vision statements, technology plans, meeting minutes, lesson plans, expenditure records	Alignment of leadership statements, planning, professional collaboration, lesson design, and resource allocation.	Contextual corroboration and audit evidence.

The observation protocol was informed by the ISTE leadership standards, the TPACK framework, and history-specific observation literature. For each lesson, the observer recorded the technology used, the instructional purpose, the degree of student agency, the historical-thinking practice emphasized, the cognitive demand, and any technical or management problem. The condensed interview and observation guides are provided in Appendix A.

D. Data Analysis

The data were analyzed using a hybrid codebook thematic approach based on [Braun and Clarke's \(2006\)](#) six phases: familiarization, initial coding, theme development, theme review, definition and naming, and report production. The analysis combined deductive and inductive logic. Deductive codes were drawn from transformational leadership and technology-leadership literature; inductive codes captured school-specific practices, barriers, collaboration, variation, and evidence that qualified the dominant interpretation.

All interview transcripts, observation notes, and documents were imported into NVivo 12. The first cycle produced 312 coded references. These were organized into 16 subthemes and four overarching themes. Code frequencies were used only as descriptive retrieval aids indicating the number of coded references, not the number of participants, the strength of a theme, or statistical prevalence. Themes were retained because of their relevance to the research questions, cross-source support, explanatory value, and variation across cases.

Two researchers independently coded 20% of the dataset using the agreed codebook. The reported 87% value was calculated as simple percent agreement: agreements divided by the total of agreements plus disagreements, multiplied by 100. It was not a chance-corrected statistic such as Cohen's kappa. Disagreements were discussed to clarify code boundaries and revise definitions. This procedure was used to improve transparency and team reflexivity rather than to imply that qualitative interpretation is purely objective ([O'Connor & Joffe, 2020](#)).

Table 5. Summary of the coding framework

Code family	Operational focus	Illustrative indicators
Idealized influence / modelling	Principal demonstrates and legitimizes valued digital practices.	Uses digital tools in meetings; publicly models experimentation; aligns actions with stated vision.
Inspirational motivation	Principal communicates a meaningful, subject-relevant purpose.	Links technology to historical inquiry, student participation, and school mission.
Intellectual stimulation	Principal challenges routine practice and invites new solutions.	Provocative supervision questions; encouragement to test tools or redesign lessons.
Individualized consideration	Principal responds to different teacher needs and capabilities.	Targeted training, coaching, recognition, and role-specific support.
Collaborative culture	Structures that enable peer learning and diffusion of practice.	Common planning time, cross-subject projects, shared repositories, peer mentoring.
Resource and technical support	Material and organizational actions that reduce implementation barriers.	Devices, software, connectivity, technical assistance, partnerships, budget decisions.
Pedagogical depth	How technology changes historical learning rather than merely delivery.	Source analysis, inquiry, interpretation, synthesis, creation versus recall-only use.
Boundary conditions / negative cases	Evidence that qualifies or contradicts a simple leadership-success account.	Technophobia, uneven competence, low-bandwidth conditions, time pressure, distraction, school differences.

E. Trustworthiness and Ethics

Trustworthiness was addressed through method and source triangulation, prolonged engagement over five months, member checking with six participants (two from each school), peer debriefing with an experienced qualitative researcher, and maintenance of an audit trail. Cross-case matrices were used to identify convergence and divergence rather than forcing all schools into one narrative. Ethical clearance was obtained from the authors' institutional review board. All participants provided written informed consent; student participation included the consent procedures required by the institution. Pseudonyms were used for schools and participants, and participants could withdraw at any time.

RESULTS

The analysis produced four overarching themes. Table 6 reports coded-reference counts for transparency, but the counts are not interpreted as measures of prevalence or importance. The narrative and cross-case analysis give priority to the meaning, source, and context of the evidence.

Table 6. Themes, subthemes, coded references, and illustrative quotations

Theme / subtheme	Coded references	Source	Illustrative quotation
Visionary digital leadership	84		
a. Articulating a clear digital vision for history	31	P1	"We are not just teaching the past; we are preparing students for a digital future. I want them to use technology to make history alive."
b. Modelling technology use	28	T2	"Our principal uses an interactive digital whiteboard in meetings, shares educational YouTube clips, and asks us to create digital portfolios."
c. Aligning vision with school mission	25	T5	"Our school mission now explicitly mentions digital literacy in all subjects, including history. That gave us a mandate."
Stimulating teacher creativity	97		
a. Encouraging experimentation	35	T3	"She challenged us to try one new digital project each semester. The first one was scary, but now I cannot imagine teaching without it."
d. Supporting professional development	33	T6	"The principal sent me and my colleague to a national webinar on digital history pedagogy and bought us subscriptions to Canva for Education."
e. Recognizing innovative practice	29	T1	"When my Virtual Museum of Independence project worked, the principal invited me to present at a school assembly."
Building collaborative culture	76		
a. History teacher learning communities	28	T4	"We now have weekly History Tech Talk sessions where we share new apps and lesson ideas."
b. Cross-subject collaboration	25	T2	"I worked with the IT teacher to create a digital archive of local history."
c. Sharing practice	23	T5	"We have a shared Google Drive where all history teachers upload their best digital lesson plans."
Mobilizing resources and technical support	68		
a. Procuring devices and software	29	P3	"Despite our limited budget, the principal convinced the foundation to purchase 20 tablets specifically for history project work."
b. Ongoing technical assistance	22	T3	"The principal assigned a part-time IT support person just for the humanities department."
4c. Addressing infrastructure problems	17	T4	"When Wi-Fi was unstable, the principal installed a separate access point in the history resource room."

Note. Counts represent coded references across interviews, observations, and documents; they are not participant frequencies or statistical weights.

A. Visionary Digital Leadership

Across the three cases, principals linked digital technology to a broader educational purpose rather than presenting it only as equipment acquisition. P1 framed digital history as a way for students to investigate rather than merely listen: "I painted a picture where our students would one day walk into a history class not to listen to a lecture, but to time-travel using VR glasses." P2, a former history teacher, demonstrated historical simulation applications during staff meetings. P3 used public recognition of small initiatives, including a Padlet gallery walk, to signal that experimentation was valued.

The vision was also visible in documents. The strategic plan at SMA N 1 Cendekia included language about transforming history learning into a digitally immersive experience, while school mission statements across cases referred to digital literacy. These documents did not prove that practice changed, but they gave teachers an institutional rationale for investing time in new lesson designs.

The cases differed in how vision was translated. Cendekia's stronger resources enabled an ambitious immersive narrative. Harmoni's vision was expressed through incremental improvement and staff development. Pelita Bangsa's principal had to negotiate with the foundation, making digital vision partly a resource-advocacy task. Thus, visionary communication was common, but its practical meaning depended on school governance and resource conditions.

B. Stimulating Teacher Creativity

Teachers described principals' questions, expectations, and small-scale challenges as prompts to reconsider conventional instruction. During supervision, P1 asked, "How can we make the Proclamation of Independence as gripping as a Netflix documentary?" T3 described a more individualized approach: the principal provided a book on digital storytelling and encouraged her to convert one chapter rather than redesign an entire course. These accounts indicate that intellectual stimulation was often paired with manageable entry points.

Professional development and recognition reinforced experimentation. P2 invited a university lecturer to provide a workshop on digital history pedagogy. P3 secured access to Canva and Edpuzzle, while P1 supported T2's pre-existing interest in film editing through a short course. The T2 example is analytically important because it shows that teacher competence and interest preceded the leadership intervention; the principal amplified an existing capability rather than creating it from nothing.

Observed lessons included virtual museum visits, collaborative timelines, digital storytelling, online primary-source analysis, gamified quizzes, and collaborative mind mapping. The pedagogical demand varied. Virtual exploration of Borobudur required students to analyze symbolism and communicate findings, whereas several quiz activities primarily reinforced factual recall. Therefore, digital innovation was not equivalent to uniformly higher-order learning.

Table 7. Digital technology-based practices observed in six history lessons

Digital practice	Frequency (of 6 observations)	School(s)	Observed cognitive demand
Virtual museum/excursion (VR/AR)	4	Cendekia, Harmoni	Analysis / inquiry
Collaborative digital timeline	5	All schools	Synthesis
Digital storytelling/multimedia	3	Cendekia, Pelita Bangsa	Creation
Online primary-source analysis	4	Cendekia, Harmoni	Evaluation
Gamified history quiz (Kahoot/Quizizz)	5	All schools	Recall / comprehension
Collaborative mind mapping (Padlet)	4	Cendekia, Harmoni	Organization / connection-making

Note. Frequencies refer to the six observed lessons and should not be generalized to all history instruction in the schools.

C. Building a Collaborative Culture

All three principals created or protected time for teacher collaboration. At Cendekia, a common free period developed into a "History Tech Lab." At Harmoni, weekly sharing sessions helped less-confident teachers seek assistance without public embarrassment. At Pelita Bangsa, the history and IT teachers collaborated on a digital archive of the school's founding history. Meeting minutes indicated an increase from no recorded cross-department sessions to eight sessions per semester after the initiative began.

Collaboration functioned as more than dissemination of successful products. Teachers described sharing failed attempts, technical workarounds, and adaptations for different classes. This evidence qualified the success narrative because it showed that innovation involved trial, error, and uneven confidence. The shared Google Drive and

interschool showcase website broadened access to lesson examples, but the initiatives were still developing and their long-term sustainability was not established.

D. Mobilizing Resources and Technical Support

Resource mobilization differed sharply across cases. Cendekia created a small History Innovation Fund, used tablets, and installed a local server for pre-downloaded content. Harmoni relied on partnerships, refurbished laptops, a separate access point, and local professional expertise. Pelita Bangsa depended on foundation approval and prioritized lower-cost platforms. These differences suggest that leadership operated partly through access to different resource networks.

Technical support reduced the perceived risk of experimentation. T3 explained that access to an IT assistant made her more willing to use complex tools because a projector or connectivity failure would no longer end the lesson. Nevertheless, barriers persisted. Teacher technophobia, connectivity, device shortages, curriculum time, and student distraction appeared across data sources. The presence of mitigation strategies did not eliminate these constraints.

Table 8. Challenges and mitigating strategies identified in the dataset

Challenge	Coded references	Examples of principal/school response	Analytical qualification
Teacher technophobia or limited skills	22	Individual coaching, step-by-step workshops, peer mentoring.	Leadership support could reduce anxiety, but teacher readiness remained uneven.
Limited internet connectivity	18	Dedicated access points, pre-loaded materials, local server.	Infrastructure shaped which innovations were feasible in real time.
Insufficient devices	15	Rotating tablet cart, BYOD, grant applications.	Access solutions could introduce participation and equity concerns not measured in this study.
Time constraints and dense curriculum	12	Project weeks, integration into existing topics.	Innovation competed with coverage expectations and preparation time.
Student distraction with devices	8	Digital citizenship agreements and structured deliverables.	Technology increased participation opportunities but also created management demands.

E. Cross-Case Variation and Disconfirming Evidence

The dominant pattern was supportive leadership, but the cases did not provide a uniform transformation narrative. Table 9 makes the variation explicit. Cendekia displayed the broadest range of resource-intensive practices. Harmoni showed that moderate-resource schools could support inquiry through targeted training and practical workarounds. Pelita Bangsa relied more heavily on foundation decisions and lower-cost tools. Across all schools, gamified review remained common, indicating that digitalization could coexist with conventional recall-oriented pedagogy.

Table 9. Cross-case comparison and qualifying evidence

Analytical dimension	Cendekia	Harmoni	Pelita Bangsa
Leadership emphasis	Ambitious subject-specific vision, modelling, innovation funding.	Incremental development, workshop support, practical problem-solving.	Advocacy to foundation, selective procurement, recognition of feasible innovations.
Observed innovation profile	Virtual visits, timelines, digital storytelling, source analysis, mind mapping, quizzes.	Virtual visits, timelines, source analysis, mind mapping, quizzes.	Timelines, digital storytelling, quizzes; fewer resource-intensive practices observed.
Key enabling condition	Stronger internal financial and technical capacity.	External partnerships and adaptive use of limited resources.	Foundation support and low-cost platforms.
Qualifying/negative evidence	Innovation opportunities were not evidence of routine use in every lesson.	Teacher hesitation and connectivity required continuing support.	Resource approval constrained the range and speed of experimentation.
Alternative explanation	Teacher interests and existing skills contributed to uptake.	Professional learning and local partnerships may explain part of the change.	Foundation governance and school market positioning may influence technology decisions.

DISCUSSION

A. Interpreting the Four Leadership Processes

The findings suggest that principals supported digital innovation through four connected processes: framing a subject-specific vision, stimulating and supporting teacher experimentation, structuring collaboration, and reducing practical barriers. These processes are consistent with transformational leadership, but the contribution of the study lies in showing how broad leadership dimensions were translated into history-specific practice. Inspirational motivation became more meaningful when it referred to historical inquiry, evidence, and representation rather than generic ICT use. Intellectual stimulation was expressed through pedagogical questions, while individualized consideration took the form of targeted training, recognition, and support matched to teachers' confidence and interests.

The cross-case evidence also supports technology-leadership research emphasizing professional development and organizational support (Anderson & Dexter, 2005; Thannimalai & Raman, 2018; Hamzah et al., 2021; Karakose et al., 2021). However, the present study does not establish that leadership caused the observed practices. Participants attributed importance to principals, documents corroborated resource and planning decisions, and observations showed technology-rich activities, but the design cannot isolate leadership from teacher agency, school resources, or external support. The appropriate conclusion is that leadership formed part of a supportive configuration.

B. Pedagogical Depth: Innovation Was Uneven

The observation data complicate the claim that digital technology automatically transformed history classrooms. Virtual museum exploration, digital storytelling, and online source analysis created opportunities for inquiry, interpretation, synthesis, and creation, consistent with digital history research (Saye & Brush, 2002; Carroll, 2012; Miralles-Sanchez et al., 2023). In contrast, Kahoot and Quizizz activities frequently remained at recall or comprehension levels. This distinction is important for leadership practice: encouraging technology use is insufficient unless leaders and teachers also discuss disciplinary purpose, task design, and evidence of student thinking. The six observations provide only bounded snapshots, so the article does not claim that all lessons shifted from lecture to inquiry. Rather, the data show a repertoire that included both more ambitious and conventional uses. A credible account of innovation must retain this unevenness.

C. Alternative Explanations and Boundary Conditions

Several alternative explanations emerged. First, teachers' prior competence and motivation mattered. T2 already had an interest in film editing, while T3 initially experienced anxiety. Leadership support interacted with these starting points. Second, school characteristics shaped opportunity. Cendekia's stronger financial and technical base enabled more resource-intensive practices, while Harmoni and Pelita Bangsa relied on partnerships, foundation decisions, and lower-bandwidth tools. Third, external actors - a university lecturer, an NGO, and a private foundation - contributed knowledge and resources. Fourth, curriculum time, connectivity, device availability, and student distraction constrained implementation.

Socioeconomic conditions may also affect device access and participation, particularly where BYOD is used, but the study did not collect household-level data and cannot evaluate this explanation. Similarly, the schools were all located in one city and had pre-existing technology initiatives. These characteristics limit transfer to rural, remote, or digitally inactive schools. The study therefore supports a context-conditioned interpretation rather than a universal leadership formula.

D. Conceptual Contribution

The study proposes a context-conditioned interpretive model, shown in Figure 1. The model is not a tested causal pathway. It organizes the cross-case evidence into leadership practices, enabling mechanisms, observed innovation forms, pedagogical tendencies, and boundary conditions. Three analytic propositions follow from the model. First, a digital vision is more likely to be meaningful when translated into subject-specific pedagogical language. Second, intellectual challenge is more likely to be sustained when combined with individualized support and structured peer learning. Third, resource mobilization reduces friction but does not by itself determine pedagogical depth; the same technology can support either inquiry or recall depending on task design.

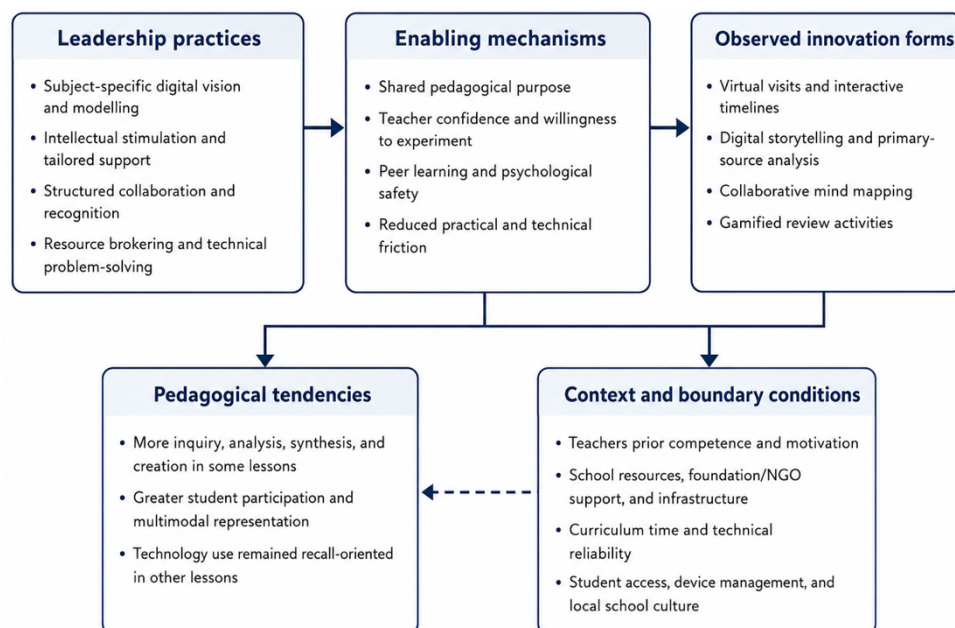


Figure 1. Context-conditioned interpretive model of leadership support for digital innovation in history learning

The model clarifies the conceptual contribution of the article: transformational leadership is interpreted as a set of context-sensitive support practices that may strengthen teacher agency and reduce barriers, rather than as a direct or sufficient cause of classroom transformation.

E. Implications for Practice and Policy

For principal development, the findings suggest four practical emphases: subject-specific digital visioning; supervision that asks pedagogical rather than merely technical questions; differentiated professional learning; and organizational routines that protect collaboration time and technical support. Training should help principals distinguish between visible technology use and disciplinary learning quality. For the Merdeka Curriculum, the findings indicate that school autonomy may create opportunities for locally relevant digital history projects, but implementation requires attention to teacher readiness, infrastructure, equity, and curriculum time. Policy implications should remain proportionate to the evidence. The three Bandung cases can inform pilot training and school-level reflection, but national policy recommendations require studies across regions, school types, and levels of digital readiness.

CONCLUSION

This multiple-case study identified four ways in which principals' transformational leadership was connected to digital technology-based innovation in history learning: articulating and modelling a subject-specific digital vision, stimulating and supporting teacher creativity, building collaborative structures, and mobilizing resources and technical assistance. These practices appeared to support teachers' willingness and capacity to experiment. The evidence does not demonstrate a causal transformation of history classrooms, and the depth of innovation varied across tools, teachers, and schools.

The study's conceptual contribution is a context-conditioned model in which leadership practices operate through shared purpose, confidence, peer learning, and reduced implementation barriers, while teacher competence, resources, external support, curriculum time, infrastructure, and student access shape what becomes possible. This formulation moves beyond a simple leadership-success claim and explains why similar leadership intentions may produce different forms of practice.

Several limitations should be acknowledged. The schools were purposively selected because they already showed evidence of technology use, creating selection bias. The study involved only three schools in one urban location and 21 participants. Six observations provided corroborative snapshots rather than a comprehensive record of routine teaching. The 87% intercoder figure was simple percent agreement, not a chance-corrected reliability coefficient. Student learning outcomes and socioeconomic access were not measured, and the study relied partly on participant perceptions that may favor successful examples.

Future research should include schools with low, moderate, and high digital readiness across urban and rural regions; use longitudinal designs to examine whether innovation is sustained; observe a larger and more varied sample of lessons; and combine qualitative evidence with measures of historical thinking, teacher digital competence, student access, and school resources. Comparative studies should also test and refine the proposed model without assuming that its interpretive connections are causal.

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