Utilizing the Wanua Tengah III Inscription in STEAM-Based History Learning to Foster Students' Historical Consciousness

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Abstract

This study explores the pedagogical potential of the Wanua Tengah III inscription as a STEAM-based resource for history learning aimed at fostering students' historical consciousness. Using a qualitative approach through systematic literature review and conceptual analysis, the study examines how the inscription can integrate Science, Technology, Engineering, Arts, and Mathematics within historical inquiry. The findings indicate that the inscription contains strong interdisciplinary elements, including material analysis of bronze, digital documentation, production techniques, aesthetic features of Kawi script, and mathematical aspects related to chronology and textual structure. These STEAM dimensions contribute to evidential, interpretive, analytical, and reflective aspects of historical consciousness. Based on these findings, the study proposes a three-stage pedagogical model consisting of interdisciplinary exploration, source-based interpretation, and reflective historical reconstruction. Although the model remains conceptual and has not yet been empirically tested, the study offers a theoretical framework for developing interdisciplinary history education and highlights opportunities for future classroom-based research.

***Keywords**: STEAM education, historical consciousness, history education, interdisciplinary learning, Wanua Tengah III inscription*

Abstrak

Penelitian ini mengeksplorasi potensi pedagogis Prasasti Wanua Tengah III sebagai sumber pembelajaran sejarah berbasis STEAM untuk mengembangkan kesadaran historis peserta didik. Penelitian menggunakan pendekatan kualitatif melalui systematic literature review dan analisis konseptual guna mengkaji integrasi Science, Technology, Engineering, Arts, dan Mathematics dalam pembelajaran sejarah. Hasil penelitian menunjukkan bahwa prasasti tersebut memiliki potensi interdisipliner yang kuat, meliputi analisis material perunggu, dokumentasi digital, teknik produksi, aspek estetika aksara Kawi, serta unsur matematika yang berkaitan dengan kronologi dan struktur teks. Setiap komponen STEAM berkontribusi pada penguatan dimensi kesadaran historis, seperti pemahaman evidensial, interpretatif, analitis, dan reflektif terhadap masa lalu. Berdasarkan temuan tersebut, penelitian ini menawarkan model pedagogis tiga tahap yang terdiri atas eksplorasi interdisipliner, interpretasi berbasis sumber, dan rekonstruksi historis reflektif. Meskipun masih bersifat konseptual dan belum diuji secara empiris, penelitian ini memberikan kerangka teoretis bagi pengembangan pembelajaran sejarah yang lebih interdisipliner serta membuka peluang penelitian lanjutan di lingkungan kelas.

***Kata Kunci:** Pendidikan STEAM, kesadaran historis, pendidikan sejarah, pembelajaran interdisipliner, Prasasti Wanua Tengah III.*

A. INTRODUCTION

In recent years, the increasing demand for interdisciplinary learning has challenged traditional approaches in history education, which have long been dominated by text-based instruction and memorization-oriented practices. Despite the recognition that history involves interpretation, evidence evaluation, and contextual reasoning, classroom practices often reduce historical learning to the transmission of narratives rather than the active construction of knowledge [1]. This condition limits students' ability to develop what scholars define as historical consciousness a reflective understanding of the relationship between past, present, and future that enables individuals to interpret historical phenomena critically and meaningfully[2]. Consequently, there is a growing need to reconfigure history education into a more inquiry-driven and interdisciplinary learning experience.

At the same time, the emergence of the STEAM (Science, Technology, Engineering, Arts, and Mathematics) approach has gained significant attention as a framework for integrating multiple disciplines to enhance students' critical thinking, creativity, and problem-solving skills[3]. While STEAM has been widely applied in science and technology education, its implementation in the humanities—particularly in history education—remains limited and often superficial. Existing studies tend to incorporate STEAM elements in history learning only at a surface level, without fully exploring the epistemological connections between historical inquiry and scientific or technological perspectives[4]. This gap suggests that the potential of STEAM to transform history education has not yet been fully realized.

One promising yet underexplored avenue for integrating STEAM into history education lies in the use of archaeological and epigraphic sources. Inscriptions, as material artifacts containing textual, technological, and cultural dimensions, offer a rich interdisciplinary platform that naturally connects historical interpretation with scientific analysis, engineering processes, artistic expression, and mathematical reasoning [5]. However, current pedagogical practices rarely utilize such sources beyond their function as historical evidence, neglecting their broader educational potential. This raises a critical question: how can epigraphic sources be reconceptualized as interdisciplinary learning resources within a STEAM framework to support the development of historical consciousness?

Scholarly debates surrounding historical consciousness further highlight the importance of this issue. Some researchers argue that historical consciousness is primarily developed through narrative understanding and historiographical engagement, while others emphasize the role of experiential and inquiry-based learning

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[1] Peter Seixas and Tom Morton, *The Big Six: Historical Thinking Concepts* (Nelson Education, 2013).

[2] Mariana Imaz Sheinbaum and Paul A. Roth, "Jörn Rüsen. *Evidence and Meaning: A Theory of Historical Studies* . Trans. Diane Kerns and Katie Digan. New York: Berghahn, 2017. Pp. 250. $120.00 (Cloth).," *HOPOS: The Journal of the International Society for the History of Philosophy of Science* 8, no. 2 (2018): 489–92, https://doi.org/10.1086/699182.

[3] Lee, Hyonyong, "Exploring the Exemplary STEAM Education in the U.S. as a Practical Educational Framework for Korea," *Journal of The Korean Association For Science Education* 32, no. 6 (2012): 1072–86, https://doi.org/10.14697/JKASE.2012.32.6.1072.

[4] Danielle Herro et al., "Co-Measure: Developing an Assessment for Student Collaboration in STEAM Activities," *International Journal of STEM Education* 4, no. 1 (2017): 26, https://doi.org/10.1186/s40594-017-0094-z.

[5] Vishal Kumar, "Review of Computational Epigraphy," version 1, preprint, arXiv, 2024, https://doi.org/10.48550/ARXIV.2406.06570.

in fostering deeper historical awareness[6]. This divergence indicates that the development of historical consciousness is not merely a cognitive process but also involves engagement with diverse forms of evidence and interpretation. In this context, integrating STEAM into history learning may offer a more holistic pathway by enabling students to approach historical sources not only as texts to be read but also as objects to be analyzed, reconstructed, and interpreted through multiple disciplinary lenses.

Based on these considerations, this study aims to examine the pedagogical potential of the Wanua Tengah III inscription as a resource for STEAM-based history learning to foster students' historical consciousness. By employing a conceptual and interdisciplinary approach, this study seeks to map the integration of STEAM components within epigraphic learning and to demonstrate how such integration can support the development of interpretive, analytical, and reflective historical thinking. The findings suggest that STEAM-based epigraphic learning can transform history education from a passive reception of information into an active process of inquiry and reconstruction, thereby contributing to a more meaningful and contextualized understanding of the past.

B. RESEARCH METHOD

This study adopts a qualitative approach grounded in conceptual analysis and systematic literature review to examine the integration of STEAM (Science, Technology, Engineering, Arts, and Mathematics) within epigraphic-based history learning. Rather than relying on empirical data collection, this research focuses on constructing a theoretical framework that connects interdisciplinary learning with the development of historical consciousness. The research process is informed by the principles of systematic literature review, which emphasize transparency, relevance, and critical synthesis of existing knowledge [7]. In this context, literature is not treated merely as supporting material but as the primary data source through which theoretical arguments are developed and evaluated. To ensure academic rigor, this study prioritizes recent publications (2020–2025) discussing STEAM education, historical consciousness, interdisciplinary learning, and the pedagogical use of archaeological or epigraphic sources, while also incorporating foundational works to maintain conceptual depth [8].

Data collection was conducted through a structured search across academic databases, including Google Scholar and indexed journal repositories, using keywords such as "STEAM in humanities," "history education," "historical consciousness," and "epigraphy in education." The selected literature was then screened based on its relevance to interdisciplinary pedagogy and its contribution to theoretical or empirical discussions. This process aligns with recommendations for integrative reviews that aim to bridge multiple disciplines and generate new conceptual insights [9].

The analysis employs a thematic and interdisciplinary mapping approach. First, key themes related to STEAM components and historical learning processes were

[6] Samuel S. Wineburg, *Historical Thinking and Other Unnatural Acts: Charting the Future of Teaching the Past*, Critical Perspectives on the Past (Temple University Press, 2001).

[7] Hannah Snyder, "Literature Review as a Research Methodology: An Overview and Guidelines," *Journal of Business Research* 104 (November 2019): 333–39, https://doi.org/10.1016/j.jbusres.2019.07.039.

[8] Herro et al., "Co-Measure."

[9] Richard J. Torraco, "Writing Integrative Literature Reviews: Guidelines and Examples," *Human Resource Development Review* 4, no. 3 (2005): 356–67, https://doi.org/10.1177/1534484305278283.

identified and categorized. Second, these themes were analytically mapped onto the characteristics of epigraphic sources, particularly the Wanua Tengah III inscription, to explore how each STEAM dimension can be meaningfully integrated into history learning. This mapping process is guided by the understanding that interdisciplinary education requires not only the combination of disciplines but also the alignment of their epistemological foundations [10].

Furthermore, this study utilizes the framework of historical consciousness to interpret the educational implications of STEAM integration. Historical consciousness is conceptualized as a multidimensional construct involving temporal awareness, interpretive reasoning, and reflective judgment about the past [11]. T hrough this lens, the analysis examines how engagement with epigraphic sources can support students in developing a more critical and contextual understanding of history.

To enhance the credibility of the study, theoretical triangulation is applied by integrating perspectives from history education, archaeology, and interdisciplinary pedagogy. In addition, iterative reading and cross-analysis of sources are conducted to minimize interpretive bias and ensure consistency in the development of arguments. While this study does not aim to produce generalizable empirical findings, it offers a theoretically grounded framework that can inform future empirical research and pedagogical practice in history education

C. RESULT AND DISCUSSION

1. Interdisciplinary Potential of Epigraphic Sources in STEAM-Based History Learning

The analysis demonstrates that epigraphic sources, particularly the Wanua Tengah III inscription, possess inherent interdisciplinary characteristics that align with the STEAM framework. Epigraphy itself is defined as the study of inscriptions involving the identification, interpretation, and contextualization of written artifacts within historical and cultural settings [12]. his indicates that inscriptions are not merely textual records but complex historical objects that integrate linguistic, material, and technological dimensions.

From a STEAM perspective, this complexity enables the inscription to function as a multidimensional learning resource. The scientific dimension emerges through the analysis of material composition and preservation processes, while the technological dimension is reflected in digital documentation and reconstruction practices, such as 3D modeling and digital archives [13]. Engineering principles are evident in the production techniques of inscriptions, particularly in metal casting and structural design, whereas artistic aspects are embedded in script aesthetics and layout. Mathematical reasoning appears in measurement systems, proportional arrangements, and chronological calculations. These findings confirm that epigraphic sources provide a natural platform for interdisciplinary integration, supporting previous research that

[10] Christine Liao, "From Interdisciplinary to Transdisciplinary: An Arts-Integrated Approach to STEAM Education," *Art Education* 69, no. 6 (2016): 44–49, https://doi.org/10.1080/00043125.2016.1224873.

[11] Seixas and Morton, *The Big Six*.

[12] Christer Bruun and Jonathan Edmondson, eds., *The Oxford Handbook of Roman Epigraphy*, vol. 1 (Oxford University Press, 2015), https://doi.org/10.1093/oxfordhb/9780195336467.001.0001.

[13] University of London et al., "Epigraphers and Encoders: Strategies for Teaching and Learning Digital Epigraphy," in *Digital Classics Outside the Echo-Chamber: Teaching, Knowledge Exchange & Public Engagement*, ed. University of London et al. (Ubiquity Press, 2016), https://doi.org/10.5334/bat.d.

emphasizes the importance of combining scientific and historical approaches to create a more holistic understanding of the past [14].

2. STEAM Integration as a Mechanism for Enhancing Historical Consciousness

The second major finding indicates that the integration of STEAM components contributes directly to the development of historical consciousness. Historical consciousness is understood as an interpretive framework through which individuals relate the past to the present and future, shaping meaning and identity [15]. The analysis shows that each STEAM component plays a distinct role. Science and Technology enhance evidential reasoning by enabling students to analyze inscriptions as physical and digital artifacts. Engineering and Mathematics support structural and analytical thinking, particularly in reconstructing fragmented or damaged inscriptions. Arts foster interpretive and reflective engagement with cultural meaning and symbolism. This aligns with empirical findings that demonstrate a strong positive relationship between STEM-based approaches, historical thinking skills, and historical consciousness development [16]. In other words, interdisciplinary engagement does not merely enrich content understanding but fundamentally transforms how students interpret historical evidence.

3. STEAM-Based Epigraphic Learning and the Development of Historical Consciousness

3.1. Science Dimension in STEAM

Epigraphic sources such as the Wanua Tengah III inscription provide a strong foundation for integrating scientific inquiry into history learning, particularly through their material characteristics as bronze artifacts. The inscription's composition requires an understanding of metallurgical properties, including oxidation, corrosion, and patina formation, which are central topics in archaeometry. Scientific analysis enables students to investigate how environmental factors, such as humidity and soil chemistry, affect the preservation of inscriptions over time. This approach transforms inscriptions from static historical texts into dynamic physical objects that undergo natural processes. Such material-based inquiry strengthens the evidential dimension of historical understanding by linking interpretation with observable physical conditions[17].

The integration of science also supports the development of evidential reasoning as a core element of historical consciousness. By examining the physical state of the Wanua Tengah III inscription, students are encouraged to question the authenticity, preservation state, and reliability of historical sources. This aligns with the view that historical knowledge is constructed through critical engagement with evidence rather than passive reception of narratives [18]. Furthermore, the scientific perspective allows students to understand that historical sources are not neutral but are shaped by material conditions and processes. This awareness fosters a more

[14] A. M. Pollard et al., *Analytical Chemistry in Archaeology*, 1st ed. (Cambridge University Press, 2007), https://doi.org/10.1017/CBO9780511607431.

[15] Sheinbaum and Roth, "Jörn Rüsen. *Evidence and Meaning*."

[16] Bunari Bunari et al., "Understanding History, Historical Thinking, and Historical Consciousness, in Learning History: An Ex Post-Facto Correlation," *International Journal of Evaluation and Research in Education (IJERE)* 12, no. 1 (2023): 260, https://doi.org/10.11591/ijere.v12i1.23633.

[17] Pollard et al., *Analytical Chemistry in Archaeology*.

[18] Wineburg, *Historical Thinking and Other Unnatural Acts*.

analytical and reflective approach to interpreting the past. Consequently, science becomes an integral component in developing deeper historical consciousness.

In addition, scientific inquiry introduces students to conservation practices that are essential in preserving cultural heritage. The study of bronze preservation techniques, including cleaning, stabilization, and environmental control, highlights the interdisciplinary nature of heritage management. Through this process, students gain insight into how science contributes to maintaining the longevity and accessibility of historical artifacts. This knowledge also encourages a sense of responsibility toward cultural heritage preservation. As emphasized in heritage science research, conservation is not only a technical process but also a cultural and educational practice[19].

However, the application of scientific approaches in history learning must be critically examined. One limitation is the lack of access to laboratory facilities or scientific instruments in many educational contexts, which may hinder the practical implementation of such approaches. Additionally, there is a risk that scientific analysis could dominate the learning process and reduce attention to historical interpretation. Therefore, it is essential to maintain a balance between scientific inquiry and historical analysis. Science should function as a supporting framework that enhances, rather than replaces, historical understanding. A well-structured pedagogical design is required to ensure that scientific integration remains meaningful and contextually relevant.

3.2. Technology Dimension in STEAM

The Techological dimension in STEAM-based epigraphic learning is reflected in the use of digital tools to document, analyze, and reconstruct inscriptions such as the Wanua Tengah III inscription. Advances in digital humanities have enabled the transformation of inscriptions into high-resolution digital objects through techniques such as 3D scanning, photogrammetry, and Reflectance Transformation Imaging (RTI). These technologies allow students to examine inscriptions in ways that are not possible through direct observation alone. For example, faded or eroded characters in Kawi script can be enhanced digitally to improve readability and interpretation. This technological engagement expands access to historical sources and supports more detailed analytical processes [20].

The integration of technology also enhances students' interpretive skills by enabling them to interact with historical data in a dynamic and exploratory manner. Digital platforms allow learners to manipulate images, compare inscriptions, and simulate reconstruction processes, which fosters active engagement with historical sources. This aligns with the principles of digital history, where technology is used not only for preservation but also for interpretation and knowledge production [21]. Furthermore, technological tools encourage students to approach inscriptions as data-rich artifacts rather than static texts. This shift contributes to the development of a more critical and inquiry-based historical consciousness.

In the context of the Wanua Tengah III inscription, technology can be used to reconstruct fragmented sections, analyze textual structures, and visualize spatial layouts. Digital epigraphy enables the integration of linguistic, material, and visual data into a unified analytical framework. This interdisciplinary approach allows students to

[19] Chris Caple, *Conservation Skills: Judgement, Method and Decision Making* (Routledge, 2000).

[20] University of London et al., "Epigraphers and Encoders."

[21] Daniel J. Cohen and Roy Rosenzweig, *Digital History: A Guide to Gathering, Preserving, and Presenting the Past on the Web* (University of Pennsylvania Press, 2006).

explore how inscriptions functioned within their historical context, including administrative practices such as sima designation. Additionally, the use of technology supports collaborative learning, as students can share and analyze digital data collectively. Such practices reflect contemporary trends in education that emphasize digital literacy and collaborative inquiry [22].

Despite its advantages, the integration of technology in history learning also presents challenges that must be critically considered. One major limitation is the unequal access to digital tools and technological infrastructure across educational settings. This digital divide may hinder the effective implementation of technology-based learning approaches. Moreover, there is a risk that technology may be used superficially, focusing on visual appeal rather than analytical depth. Therefore, it is essential to ensure that technological tools are used to support meaningful historical inquiry rather than replace it. A balanced approach is necessary to align technological innovation with pedagogical objectives.

3.3. Engineering Dimension in STEAM

The engineering dimension in epigraphic learning is closely related to the production techniques and structural design of inscriptions such as the Wanua Tengah III inscription. The creation of bronze inscriptions involves complex processes, including metal extraction, alloy preparation, molding, and casting. These processes reflect a high level of technological sophistication in ancient societies. By examining these techniques, students can understand how engineering knowledge contributed to the production of durable historical records. This perspective highlights the intersection between technology, craftsmanship, and historical documentation [23].

Engineering analysis also allows students to explore the structural aspects of inscriptions, including size, thickness, and layout. The Wanua Tengah III inscription, with its specific dimensions and dual-sided text arrangement, demonstrates deliberate design choices that affect readability and durability. Understanding these structural features helps students appreciate the functional and practical considerations behind inscription production. It also encourages them to think about how physical design influences the transmission of historical information. Such analysis strengthens students' ability to connect form and function in historical artifacts.

Furthermore, the engineering perspective supports problem-solving and analytical thinking in history learning. Students can engage in reconstruction activities, such as hypothesizing how inscriptions were produced or how damaged sections might be restored. These activities require logical reasoning and an understanding of material constraints. This aligns with the broader goals of engineering education, which emphasize design thinking and iterative problem-solving processes [24]. As a result, engineering becomes a bridge between technical knowledge and historical interpretation.

However, integrating engineering into history learning also requires careful pedagogical consideration. One challenge is the potential complexity of engineering

[22] University of London et al., "Epigraphers and Encoders."

[23] Titi Surti Nastiti, *Survei Prasasti Zaman Hindu-Buddha Di Daerah Istimewa Yogyakarta Dan Provinsi Jawa Tengah Tahun 2023*, Cetakan pertama, with Organisasi Riset Arkeologi, Bahasa, dan Sastra (Indonesia) et al. (KPG (Kepustakaan Populer Gramedia) bekerja sama dengan Badan Riset dan Inovasi Nasional (BRIN), Organisasi Riset Arkeologi, Bahasa dan Sastra, École française d'Extrême-Orient (EFEO), 2024).

[24] Clive L. Dym et al., "Engineering Design Thinking, Teaching, and Learning," *Journal of Engineering Education* 94, no. 1 (2005): 103–20, https://doi.org/10.1002/j.2168-9830.2005.tb00832.x.

concepts, which may be difficult for students without a technical background. Additionally, there is a risk that the focus on technical processes may overshadow the cultural and historical significance of the inscription. Therefore, it is important to contextualize engineering analysis within broader historical narratives. By doing so, engineering can enrich rather than dominate the learning process.

3.4. Arts Dimension in STEAM

The arts dimension in epigraphic learning is evident in the aesthetic and symbolic aspects of inscriptions, particularly in the use of Kawi script and textual layout in the Wanua Tengah III inscription. The visual form of the script reflects not only linguistic function but also artistic expression and cultural identity. The arrangement of text, spacing between lines, and stylistic variations in characters demonstrate deliberate aesthetic choices. These features allow students to explore inscriptions as works of visual culture rather than purely informational texts. Such an approach aligns with the integration of arts in STEAM, which emphasizes creativity and interpretation[25].

Engaging with the artistic elements of inscriptions also enhances students' interpretive and reflective abilities. By analyzing script styles and visual patterns, students can gain insights into cultural values, religious influences, and social hierarchies embedded in the inscription. This process encourages them to consider how meaning is constructed not only through words but also through visual representation. It also supports the development of historical empathy by connecting learners with the cultural context of the past. In this sense, arts play a crucial role in deepening historical understanding.

Moreover, the integration of arts allows for creative learning activities, such as reproducing inscription scripts or designing visual interpretations of historical content. These activities promote active engagement and personal connection with historical material. They also encourage students to express their understanding in diverse ways, moving beyond traditional written assessments. This aligns with contemporary educational approaches that value creativity and multimodal learning. As a result, the arts dimension contributes to a more holistic and engaging history learning experience.

Nevertheless, the inclusion of arts in history education must be carefully balanced to maintain academic rigor. There is a risk that creative activities may become detached from historical accuracy if not guided properly. Additionally, aesthetic appreciation alone is insufficient without critical analysis of historical context. Therefore, it is important to integrate artistic exploration with evidence-based interpretation. This ensures that creativity enhances rather than undermines historical learning.

3.5. Mathematics Dimension in STEAM

The mathematics dimension in epigraphic learning is reflected in the quantitative and structural aspects of inscriptions such as the Wanua Tengah III inscription. The measurement of dimensions, including length, width, and thickness, requires an understanding of basic mathematical concepts. Additionally, the arrangement of text into specific numbers of lines on each side of the inscription demonstrates patterns that can be analyzed mathematically. These features provide

[25] Elaine Perignat and Jen Katz-Buonincontro, "STEAM in Practice and Research: An Integrative Literature Review," *Thinking Skills and Creativity* 31 (March 2019): 31–43, https://doi.org/10.1016/j.tsc.2018.10.002.

opportunities for students to engage with numerical data within a historical context. This integration highlights the relevance of mathematics beyond abstract calculations.

Mathematical reasoning also plays a role in chronological analysis, particularly in converting traditional calendar systems into modern equivalents. Inscriptions often use dating systems such as the Saka calendar, which requires calculation and interpretation to determine corresponding years in the Gregorian calendar. This process helps students understand the temporal dimension of history more concretely. It also reinforces the idea that historical knowledge involves analytical skills as well as narrative understanding. Such integration supports the development of chronological awareness as a component of historical consciousness.

Furthermore, mathematics supports pattern recognition and structural analysis in epigraphic studies. Students can analyze the distribution of text, identify symmetrical patterns, and examine proportional relationships within the inscription. These activities encourage logical thinking and attention to detail. They also demonstrate that mathematical concepts can be applied in diverse contexts, including the humanities. This interdisciplinary approach enhances students' ability to connect different forms of knowledge.

However, the integration of mathematics into history learning may present challenges, particularly for students who perceive mathematics as unrelated to historical studies. This perception can create resistance and reduce engagement. Therefore, it is important to present mathematical activities in meaningful and contextually relevant ways. By linking mathematical concepts directly to historical inquiry, educators can help students recognize their practical value. This approach ensures that mathematics contributes effectively to interdisciplinary learning.

3.6. Integrative Framework of STEAM and Historical Consciousness

The integration of STEAM in epigraphic-based history learning is not merely a combination of disciplinary perspectives, but a coherent framework that enables a multidimensional understanding of historical sources. In the context of the Wanua Tengah III inscription, each STEAM component contributes distinct yet interconnected epistemic functions that collectively shape historical inquiry. Science provides material evidence, technology enhances accessibility and reconstruction, engineering reveals production logic, arts interpret symbolic meaning, and mathematics structures analytical reasoning. When these dimensions are integrated, students are able to approach inscriptions as complex historical systems rather than isolated textual artifacts. This integrative process aligns with the interdisciplinary learning paradigm that emphasizes the synthesis of knowledge across domains [26].

Furthermore, the integration of STEAM creates a pathway for developing historical consciousness through active engagement with evidence, interpretation, and reflection. Rather than passively receiving historical narratives, students are positioned as investigators who analyze, reconstruct, and interpret historical sources from multiple perspectives. This process supports the development of temporal awareness, as students understand the historical context of the inscription and its relevance to present conditions. It also enhances interpretive competence by encouraging students to evaluate the reliability and meaning of historical evidence. As argued in historical thinking frameworks, such engagement is essential for fostering deeper historical consciousness [27].

[26] Perignat and Katz-Buonincontro, "STEAM in Practice and Research."
[27] Seixas and Morton, *The Big Six*.

The integrative model also highlights the role of inquiry-based and problem-based learning in connecting STEAM with history education. Through interdisciplinary tasks, such as reconstructing damaged inscriptions or analyzing their socio-political functions, students engage in authentic problem-solving processes. These activities require the simultaneous application of scientific reasoning, technological tools, and historical interpretation. This approach reflects broader educational trends that emphasize the importance of active learning and knowledge construction[28]. Consequently, STEAM integration transforms history learning into a dynamic and participatory process.

However, achieving meaningful integration requires careful pedagogical design to avoid superficial implementation. One major challenge is ensuring that each STEAM component is not treated as an isolated element but as part of an interconnected learning system. Without this integration, there is a risk that STEAM becomes a fragmented approach that fails to enhance historical understanding. Additionally, teachers must possess sufficient interdisciplinary competence to guide students effectively through complex learning processes. Therefore, the success of STEAM-based epigraphic learning depends not only on the availability of resources but also on the quality of instructional design. A well-structured integrative framework is essential to ensure that STEAM contributes meaningfully to the development of historical consciousness.

D. CONCLUSION

This study demonstrates that epigraphic sources, particularly the Wanua Tengah III inscription, hold significant potential as interdisciplinary learning resources within a STEAM-based framework in history education. By moving beyond conventional text-centered approaches, the integration of Science, Technology, Engineering, Arts, and Mathematics enables a more comprehensive engagement with historical sources as material, cultural, and analytical entities. This approach addresses the existing gap in history education, where learning often remains fragmented and lacks meaningful interdisciplinary connections.

The findings indicate that each STEAM component contributes distinct yet interconnected roles in supporting historical inquiry. Scientific analysis strengthens evidential reasoning through material examination, technological tools enhance accessibility and reconstruction, engineering perspectives reveal production logic, artistic dimensions deepen interpretive and cultural understanding, and mathematical reasoning supports structural and chronological analysis. When integrated, these dimensions transform epigraphic learning into a holistic process that connects multiple ways of knowing. This integration not only enriches students' understanding of historical sources but also strengthens their ability to engage critically with the past.

In addition, this study highlights that STEAM-based epigraphic learning plays a crucial role in fostering historical consciousness. Through interdisciplinary engagement, students develop temporal awareness, interpretive competence, and reflective understanding of historical phenomena. Rather than passively receiving historical narratives, learners become active participants in reconstructing and interpreting the past. This shift represents a fundamental transformation in history education, aligning it with contemporary educational demands for critical thinking, inquiry, and contextual understanding.

[28] Herro et al., "Co-Measure."

Despite these contributions, this study is limited by its conceptual nature and lack of empirical validation in classroom settings. The proposed framework requires further testing through experimental or design-based research to examine its effectiveness in diverse educational contexts. Future studies are encouraged to explore the practical implementation of STEAM-based epigraphic learning, particularly in relation to digital technology integration and teacher readiness. These considerations highlight the importance of bridging theoretical development with empirical application.

In conclusion, the integration of STEAM in epigraphic-based history learning provides a promising pathway for rethinking history education as an active, interdisciplinary, and reflective process. By positioning inscriptions as complex learning resources rather than static texts, this approach opens new possibilities for developing deeper historical understanding and more meaningful engagement with the past. This study repositions epigraphic sources not merely as historical evidence, but as interdisciplinary learning systems capable of bridging scientific inquiry and historical interpretation in meaningful ways.

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