



Immersive Digital Oral History in History Education: A Systematic Review of Metaverse and Digital Heritage

Ulfatun Nafi'ah^{1*}, Sariyatun Sariyatun² and Deny Tri Ardianto³

^{1,2,3}Universitas Sebelas Maret, Surakarta, Indonesia
ulfatun.nafiah@student.uns.ac.id

Abstract. This study explores immersive digital oral history in history education through a systematic review of the metaverse, virtual heritage, and digital heritage. The novelty of digital oral history lies in investigating its position within the landscape of immersive technology research, which has predominantly focused on object visualization, user experience, and cultural heritage reconstruction. The review followed the PRISMA 2020 guidelines and utilized data from Scopus and Web of Science. From the 154 records initially identified, 123 documents were synthesized; metadata from 122 Scopus publications was used for bibliometric mapping. The results show a noticeable rise in the number of publications after 2021 and identify four main themes: immersive environments for historical reconstruction and interpretation; immersive history learning and enhancing historical thinking; and participatory narratives as a means to develop immersive digital oral history. A critical finding is that oral history has not yet risen to prominence as a node of the keyword network, while digital storytelling, learners, co-design, digital cultural heritage, game design, and extended reality (XR), among others, have seen an increasing trend. The IDOH-P model encompasses human testimony, digital archives, community memory, virtual reconstruction, and historical thinking. The findings suggest that immersive technologies aim not just at the visualization of cultural heritage, but also at the construction of reflective learning environments that expand the authority of narrators and reinforce the democratization of historical knowledge. Such technologies can also act as participatory spaces to preserve memory, promote historical thinking, and enrich historical representation. These insights offer a conceptual framework for educators and researchers to incorporate immersive technology-based digital oral history into history education in ways that can be more diverse, reflective, and impactful.

Keywords: Digital Oral History, Immersive Technologies, History Education, Metaverse, Virtual Heritage, Digital Heritage, Indonesia.

1 Introduction

History education should provide learning resources in a way that can allow students to learn about the past as a human experience and not as a sequence of events. Oral history makes room for the narrator's voice, memory, pauses, emotions, interpretations, which are not readily available in official archives. Portelli explains that the importance of oral history revolves around the interpretations, or meanings,

that people attach to their history [1]. Through the construct of shared authority, Frisch situates historical knowledge as constructed through the interplay of relationships among researchers, narrators, communities, and the public [2]. Ritchie also concludes that oral history always entails informed consent, ethical responsibility, as well as the protection of the rights of the narrators [3]. In history education, such principles correspond to the need to develop students' ability to analyze evidence from multiple perspectives, which includes the ethical dimensions of the past [4]. Hence, this paper not only reviews the proliferation of new technologies in history education but also the degree to which oral history has been woven into the discourse around immersive technologies as a concept.

Immersive technologies have widened the presentation horizon of historical materials. In this study, immersive technologies are employed as a conceptual construct for virtual reality (VR), augmented reality (AR), mixed reality (MR), extended reality (XR), virtual museums, and the metaverse. These are technologies that can provide places, objects, sounds, and interaction to add context to the learning process. Yet live experiences cannot always create historical understanding. Each digital reconstruction is formed by choices of source, space, narrative structure, and interpretive choices of historians and curators. Accordingly, immersive technologies can be conceived as an interpretative arena to be appraised critically.

History education studies in the digital age have theorized that students are to be engaged in taking on the role of interpreters of digital archives, navigable media and 'representations' of the past within virtual environments [5]. In this sense, oral history is more than a transcript. Audiovisual oral history sources represent voices, gestures, facial expressions, pauses, emotions, as well as social relations, and these should be carefully observed and interpreted [6], [8]. Digital archival approaches can potentially enhance the process of retrieval and processing of historical data, but computational technologies need not restrict testimony to keywords or fragmentary text [7]. The principle of affective listening goes a step further, articulating that users of digital archives should feel an ethical responsibility toward those voices [9].

The immersive aspect of this research revolves around the ideas of virtual heritage and digital cultural heritage. Authenticity, accuracy, ethics, and user experience evaluation must be ensured on virtual heritage [15]. Virtual museums and immersive reality technologies have increased students' experiences of culture and the accessibility of cultural collections, heritage buildings and landmarks that they cannot normally access in traditional physical museums [16]. In case studies in cultural heritage, extended reality (XR) technologies were extensively utilized [17], and technology, experiential goals, interaction design, and evaluation practices were already established during their design process. Interactive media for the preservation of cultural heritage have also evolved to utilize 3D modeling, games, collaborative environments, digital narratives, and immersive experiences [18].

This work interrogates the conceptual junctions between oral history and immersive technologies. Virtual reality (VR) in digital oral history projects enable historical events to be presented as a learning experience that creates empathy and historical participation among students [10]. Nevertheless, the use of VR-based oral history should not depend only on the efficacy of presence. Rather than focusing on the mere presence, learning should prompt students to ask who is speaking, based on what experiences, within what social context, and with what authority to represent the

past. A student-centered approach in oral history solidified this need. History education, therefore, needs to allow students to reflect on ethical relations and cultural experiences that engage more with their own lived experience [11].

There has been a growing development of ‘digital technology integration in oral history practice where an important part of the need for identification of historical sources emerges through interviews, electronic recording, documentary film technology, archives management and digital storage systems, with interview work and digital recording [12]. Oral history writing on families and communities has also shown that intergenerational memory can be a valuable resource for the enrichment of history education through linking historical learning to lived experiences within a community [13], [14]. Thus, immersive digital oral history can aid in integrating oral history practices, online archives, visual media, and history instruction and practice in the age of virtual history. This model does not just document the past; it directs students to interpret historical evidence and ponder ways to generate historical representations.

The importance of this study is also emphasised by the Indonesian context. Oral history has also been used to reveal social phenomena rarely presented in official historical knowledge [35]. Archival research indicates that oral history programs require systematic management of historical recordings, metadata, accessibility, and long-term preservation [36]. At the same time, a variety of digital initiatives in Indonesia have adopted technologies such as VR and AR to support the learning of Indonesian history and culture [37]–[39]. Other projects have incorporated metaverse technologies and the digitalization of historic buildings as a means of heritage preservation [40], [41]. Many of these projects are still largely geared towards visualization of historical sites, cultural artifacts, and heritage spaces. Narrators’ voices, community memory, family archives and local testimonies remain underrepresented in immersive history learning experiences.

Considering this background, three questions are answered in this study. In what ways has the body of literature on immersive technology, the metaverse, virtual heritage, digital heritage and memory-based narratives changed since 2019? Second, which research themes were most likely to appear from 2019 to 2026? Thirdly, what are the opportunities, limitations, and major impacts that immersive technology brings regarding digital oral history in history learning? The contribution of this study is that it develops a history learning framework that features evidence, the voice of the narrator, the collective memory of the community, and participatory rules as the essential elements of history learning. IDOH-P (Immersive Digital Oral History for Participatory History Education), as a conceptual framework, will represent a concept that connects digital oral history, immersive technology, and history education as student-dependent. This framework not only treats oral histories like interview recordings but also as an audiovisual source – oral communication that incorporates voice, gestures, feelings, social settings, as well as the relationship between the narrator and the questioner. Via VR, AR, XR, metaverse, virtual museums and digital storytelling technologies, IDOH-P offers students possibilities for interaction with community memories. In this way, immersive technology is not just a means of presentation of cultural heritage assets, but for learning, it supports the interpretation of historical evidence, viewpoint, and reflection of the storyteller, critical assessment

of digital representation, and the construction of a more just and inclusive historical learning.

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2 Method

This study employed a systematic literature review following the PRISMA 2020 guidelines [33]. The literature search was conducted on 25 June 2026 using the Scopus and Web of Science databases. The search string integrated three groups of keywords: immersive technologies, digital cultural heritage, and historical narratives. The first group comprised metaverse, virtual reality, augmented reality, mixed reality, extended reality, and immersive technologies. The second group included cultural heritage, digital heritage, virtual heritage, heritage education, and virtual museum. The third group consisted of oral history, testimony, community memory, digital storytelling, history education, and historical thinking. The complete search string is presented in the methodology section to ensure the transparency and reproducibility of the identification process, rather than relying solely on the authors’ interpretation.

Table 1. PICo Framework and Literature Review Strategy.

Component	Scope
Population	History education, students, teachers, museums, cultural heritage communities, and oral history practitioners.
Interest	Immersive technology-based digital oral history, the metaverse, virtual heritage, digital heritage, virtual museums, and digital storytelling.
Context	Scopus- and Web of Science-indexed publications from 2019–2026 related to history education, cultural heritage representation, memory, and community narratives.
Example search string	((“metaverse” OR “virtual reality” OR “augmented reality” OR “mixed reality” OR “extended reality” OR “immersive technology” OR “virtual world”) AND (“cultural heritage” OR “digital heritage” OR “virtual heritage” OR “heritage education” OR “virtual museum”) AND (“oral history” OR “oral narrative*” OR “testimon*” OR “life story” OR “community memory” OR “digital storytelling” OR “history education” OR “historical thinking”)) AND PUBYEAR > 2018

The criteria for inclusion were journal articles, conference papers, book chapters, books, and data papers published between 2019 and 2026. Eligible documents contained a substantive abstract and addressed the theme of immersive technologies, cultural heritage, memory, narrative, or history education. Formal review articles, errata, short surveys, conference reviews, and technical studies not related to cultural heritage, memory, narrative, or education were excluded. After discarding 18 duplicate records from 154 original records, 136 records were left for further screening. A total of 123 documents were used for the systematic synthesis, while metadata of 122 Scopus publications were used for bibliometric visualization because a record did not have complete metadata.

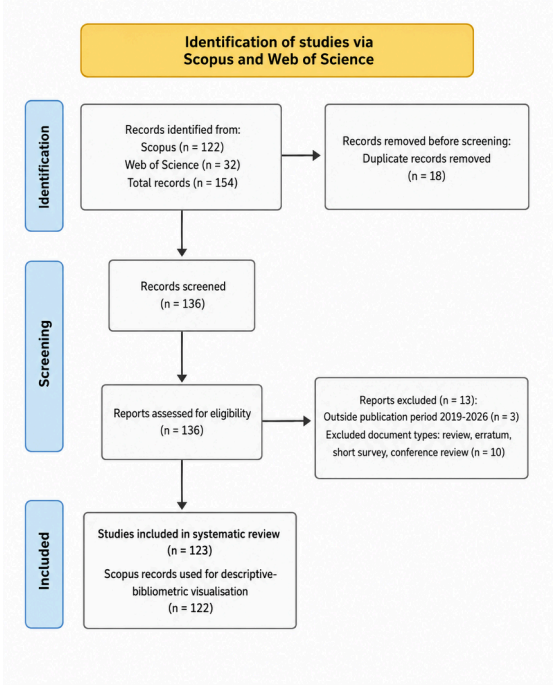


Fig. 1. PRISMA Flow Diagram of Primary Study Selection.

Table 2. Dataset Coverage and Analytical Use.

Analysis Stage	Number of Records	Use in the Study
PRISMA identification	154 initial records	Comprised 122 Scopus records and 32 Web of Science records.
After deduplication	136 records	Eighteen duplicate records were removed based on DOI and title.
Final SLR dataset	123 documents	Used for the overall interpretation and critical thematic synthesis.
Scopus bibliometric subset	122 records	Used for analyses of publication trends, source journals, countries, research methods, and keyword co-occurrence.

The quality of included studies was determined based on the articles’ focus, the completeness of their metadata, the clarity of the abstract and the extent to which each article related to or added to the research questions. Title, abstract, and keywords were manually classified systematically by method. Author keywords and indexed keywords were standardized via the combination of spelling variants, singular and plural forms, synonyms, and overly general terms. Keyword co-occurrence visualization was created using VOSviewer according to the full counting method and at least two keyword occurrences [34]. The resulting themes were then analysed thematically by analyzing relationships among keywords, representative studies within each cluster, and their relevance to immersive digital oral history. The theme

was constructed throughout three phases: identifying the thematic focus and conceptual proximity of terms as depicted on the bibliometric map, reading representative articles from the various clusters, and interpreting their relationship with immersive digital oral history.

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3 Result and Discussion

3.1 Literature Development on Immersive Technologies and Digital Heritages since 2019

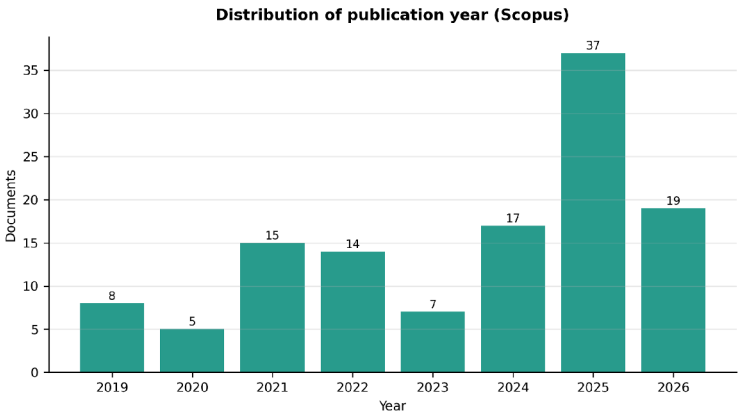


Fig. 2. Distribution of Scopus Publication.

Figure 2 displays the increase in publications after 2021. The dataset showed 8 documents in 2019, 5 documents in 2020, 15 documents in 2021, 14 documents in 2022, 7 documents in 2023, 17 documents in 2024, 37 documents in 2025, and 19 documents in 2026. In this regard, the research on immersive technologies and cultural heritage has demonstrated sustained growth, coinciding with the expanding use of virtual museums, VR, AR, XR, and the metaverse in education and cultural heritage preservation. More importantly, it reflects a realignment in research priorities from digital documentation toward learning experiences, user engagement, and shifting conceptualizations of 'representational authority'. For history education, this post-2021 shift is also important because immersive technologies have shifted from documentation tools to learning conditions that necessitate critical interpretation of historical sources, community engagement, and ethical responsibility in representing the past.

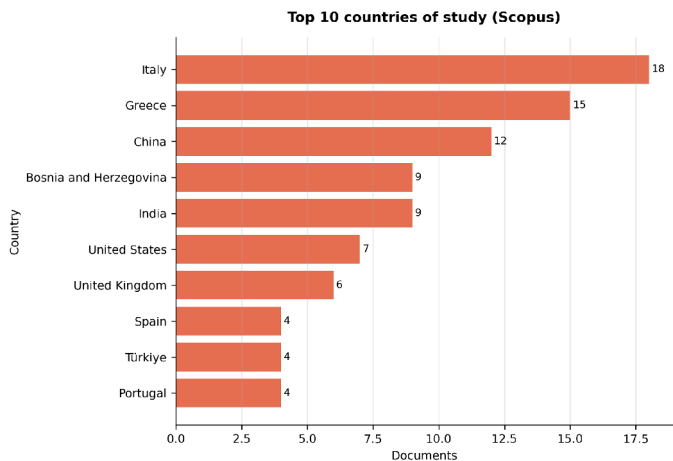


Fig. 3. Top Ten Countries by Author Affiliation in the Research Dataset (Scopus).

The distribution of publications indicates that Italy, Greece, China, India, Bosnia and Herzegovina, the United States, the United Kingdom, Spain, Türkiye, and Portugal are among the leading contributors to research in this area. Research into immersive technologies for cultural heritage preservation has progressed mainly out of existing digital archaeology, historical site reconstruction, and virtual museum development activities. This geographic distribution also suggests that it suffers from an important limitation. Models created around European heritage sites or major museums cannot be automatically applied to contexts around local communities, Indigenous communities, and educational institutions in Indonesia. Immersive digital technologies in history education must therefore be adapted to local social conditions, language use, access to technological infrastructure, and relationships between the communities.

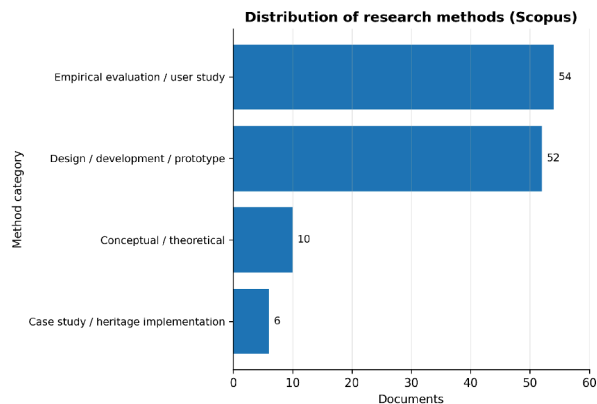


Fig. 4. Distribution of Research Methods Inferred from Scopus Metadata.

Figure 4 shows that empirical evaluation or user studies are the largest category, with 54 publications. The next prominent category is studies covering design, development, and prototyping (52 publications). Conceptual papers amount to 10 publications, while case studies on cultural heritage applications account for 6 publications. The field is heavily focused on usability, user engagement, and system development. Despite significant success, these moves cannot fully capture the trends in history education. Future research should test whether immersive experiences empower students to critically assess historical evidence, analyze competing explanations, hear the voices of narrators, and identify marginalized voices in historical narratives.

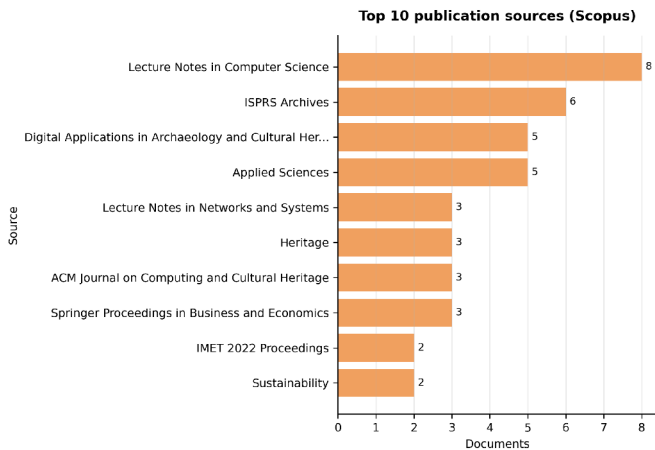


Fig. 5. Top Ten Publication Sources (Scopus).

The major publication sources are focused on computer science, digital archaeology, museum studies, human–computer interaction, sustainability, and education. This pattern points to the maturity of immersive technologies as a research domain focused on technical innovation and experience design. However, publication venues specifically devoted to history education remain relatively limited. This is the crucial gap that serves as a primary rationale for the current investigation. Future studies of immersive digital oral history can shift their attention from visuals and user experience to historical evidence, voice, memory, authority, and ethical responsibility.

3.2 Dominant Themes Identified through Keyword Co-occurrence Analysis

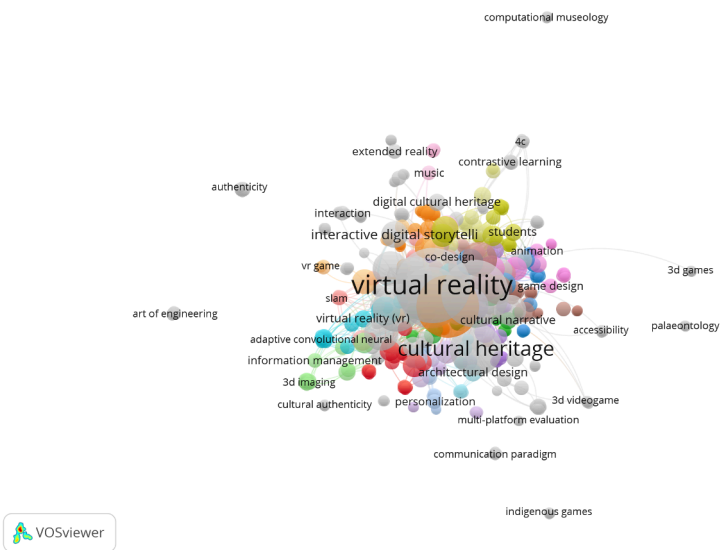


Fig. 6. Keyword Co-occurrence Network Visualization Based on the Scopus Dataset.

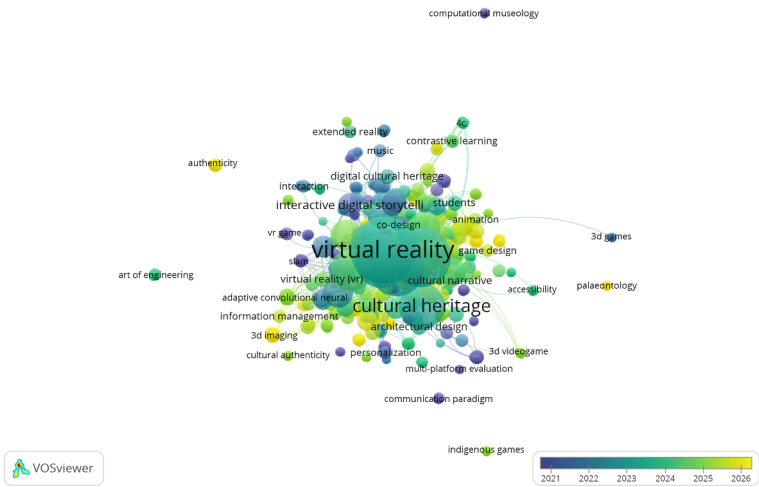


Fig. 7. Overlay Visualization of Keyword Co-occurrence Based on the Scopus Dataset.

Four major themes were identified from the literature published between 2019 and 2026. Virtual reality and cultural heritage are the biggest nodes in the network (see Figure 6). These nodes are bounded by key concepts such as digital storytelling,

learners, co-design, authenticity, game design, user experience, and digital cultural heritage. These relationships show that the field is no longer only concerned with the reconstruction of historical objects. Far from becoming just about retelling these objects, however, it focuses on learning, participation, and narrative construction. However, the network is still focused on technology- and heritage-related ideas as opposed to oral history.

Figure 7 corroborates this interpretation by having a plot of keyword emergence over time overlaid. The newest words – digital cultural heritage, learners, co-design, comparative learning, game design, and extended reality (XR) – are some of the newer research directions. These trends indicate an emerging awareness of immersive technologies as both educational media and modes of participatory environments. Likewise, there is an increasing focus on digitalization, accessibility, preservation, and user experience through bibliometric analysis [29]. In addition, research into the metaverse and extended reality (XR) describes cultural heritage as a learning environment that requires appropriate standards, design principles, and sustainability strategies [26], [27].

The strongest bibliometric evidence is in oral history. Oral history is not present as a central node and does not form a principal linkage between clusters. That is, it still occupies less space than virtual reality, cultural heritage, digital storytelling, learners, and user experience. This observation should not be seen as evidence that oral history is missing from digital practice. Instead, it reflects that ethical issues of oral history, narrators’ rights, and community memory have not yet emerged as core debates on immersive technologies. This is the conceptual gap that forms the study in the current paper. Oral history has not emerged as a core organizing principle.

Table 3. PICo Framework and Literature Review Strategy.

No.	Themes	Core Findings	Authors	Implications
1	Immersive Space as Historical Reconstruction and Interpretation	VR, AR, MR, XR, metaverse, 3D visualization, and virtual environments are used to recreate cultural spaces, heritage objects, and past experiences in a more contextual way. However, immersive reconstructions cannot be understood as a substitute for historical reality, as each visual model is always shaped by the choice of sources, design, and curatorial decisions.	Selmanovic et al. (2020); Bozzelli et al. (2019); Okanovic et al. (2022); Olaz et al. (2022)	Immersive environments need to be designed as evidence-based interpretive spaces. Users should be given an understanding of what is derived from historical data, what is reconstructive, and what is curatorial interpretation. In this way, immersive technology not only provides a visual experience but also opens up a space for understanding the limits and responsibilities of historical representation.
2	Preservation of Digital	Virtual museums and digital preservation	Ntagiantas et al. (2021);	Digital preservation has the challenge of maintaining

Heritage and the Authenticity of Cultural Representations	serve more than just the function of storing cultural objects. They also shape how knowledge is organized, historical context is determined, access is chosen, and the meaning of heritage is interpreted. Therefore, the issue of authenticity in digital heritage concerns not only the accuracy of visual form, but also the traceability of sources, metadata, narrative authority, and community engagement.	Kenderdine et al. (2021); Mathioudakis et al. (2021); Ren and Lam (2026)	the link between historical objects, historical sources, community narratives, and their social contexts. Preservation for immersive digital oral history means that the narrator's voice, the rights of the community, and the cultural significance are not reduced to mere visual material. For instance, the implication is the requirement of a transparent, participatory, and sensitive model of curation that recognizes power relations relevant to their representation of cultural heritage.
3 Immersive History Learning and Strengthening Historical Thinking	The analysis focuses on immersive technology to experience learning, inquiry, inclusive access, interaction design, and historical thinking. The pedagogical worth of this technology is not only in its form, by the way it looks, but in the way it helps students to read evidence, comprehend context, compare perspectives, and make historical arguments.	Gibson et al. (2022); Barbara (2022); Petousi et al. (2022); Dordio et al. (2024)	Immersive technology-based history classroom experiences require a framing that positions learning as inquiry, not as experience traveling within virtual spaces. Students will be taught how to assess sources, to notice the ambiguity of reconstruction, to hear the position and positionality from the narrator, and how the historical positionality is built into narratives. Immersive technology does this, however, by strengthening historical literacy, historical empathy, and critical awareness of representations of the past.
4 Participatory Narrative as a Bridge to Immersive Digital Oral History	Digital storytelling, game design, co-design, as well as Indigenous narratives, voice, testimony, and community memory	Petousi et al. (2022); Egea-Vivancos and Arias-Ferrer (2021); Silva et al. (2023);	Participatory narratives should consider the ethics of oral history, the role of narrators, and community involvement in the processes from the design phase. Within history

connect immersive technology and digital oral history. Immersive experience is more significant when users are sharing more than just a source of information. Rather, they interact with community narratives, sources, and perspectives.	Tong et al. (2024)	education, digital narrative and game design not only need to seek user engagement but also to ponder source critique, multiple perspectives, and ethical reflection. The trends imply the urgency to promote learning pedagogies that allow spaces for community participation in constructing historical knowledge.
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Table 3 indicates that the four themes encompass a systematic conceptual structure, with each theme being an additional piece to the whole puzzle. Immersive environments illustrate the way digital technologies illustrate historical knowledge in visual reconstruction, virtual atmosphere, and user-centered content. These types of experiences have meaning only when historical sources, cultural materials, metadata, and community memory are handled contextually. History education’s theme is to draw heavily on digital experience to build students’ capability to investigate historical evidence and see things from multiple perspectives. In this way, participatory narratives guarantee that the voices of these narrators, testimonies, and experiences contribute to the development of immersive technologies. As such, immersive digital history can never be built using new media technologies, such as VR, AR, XR, or the metaverse. Such a model combines immersive learning environments, heritage preservation practices, history pedagogy, and participatory ethics. It is not until such integration happens that immersive technologies can move away from being technologies for portraying cultural heritage toward reflective learning contexts informed by historical record, aimed at reinforcing community memory.

3.3 Immersive Space as Historical Reconstruction and Interpretation

Immersive technologies underpin cultural heritage research as they broaden the methods that users have access to, the understanding, and the experience of the past. VR allows reliving intangible cultural knowledge that might otherwise not be physically available to be re-enacted as virtual environments that can better capture cultural occurrences [42]. User-oriented VR and AR methodologies also emphasize interaction, navigation, and user engagement in the visual quality of immersive media [43]. In XR applications, users are no longer passive observers, but they actively navigate through virtual worlds, select paths, inspect electronic props, and form connections with spaces to represent specific historical experiences [44]. Mixed reality-based heritage tours and affective experiences show the possibility of considering cultural heritage by linking place, embodiment, memory, and emotion [45].

The research around immersive technologies is strongly oriented toward the reconstruction of cultural spaces and the enrichment of user experiences. These are

important because immersive technologies open up cultural objects, heritage sites, and cultural practices to wider audiences. However, it should be noted that any digital reconstruction is never fully neutral. All three-dimensional models, ambient sound, avatars, maps, camera perspectives, and pathways are informed by source selection and curatorial interpretation. This implies that virtual heritage ought to articulate the evidentiary grounding of its representations, the limits of reconstruction, and the interpretive motivation behind representations of the past [15]. Moreover, research related to virtual museums and XR has clarified that the quality of immersive experiences should not only be determined by presence or appeal but also in relation to representation ethics and traceability of historical data, as well as the educational goals they promote [16], [17].

Immersive digital oral history implies that immersive technologies must be restructured from visual reception to spaces for historical investigation. They should not be designed to bring them to present-day reality, but should also allow them to understand the past. Instead, immersive technologies need to let participants know who is actually speaking, the social context of narrator voices, which evidence supports the narrative, and what elements of that reconstruction are interpretative. When immersive environments present testimony without context, revealing information about the narrator, or explaining the curatorial process, narrators risk being reduced to mere visual elements. This means immersive environments need to be situated for critical questioning to interrogate historical sources of history, understand the bounds of representation, and appreciate that digital experiences are interpretations, not reinterpretations of history.

This study suggests ample future avenues in Indonesia and indicates the existing constraints for creating immersive digital oral history. As such, the Virtual National Museum has expanded public accessibility to museum collections and opened new avenues for museum-based learning [37]. Immersive technologies—like the VR Lontar Prasi Bali project, the AR/VR Bongal Site, the Baileo Negeri Rutong metaverse, and the digitalization of the East Hall ITB—show that such technologies are increasingly prevalent in cultural education and historical site preservation [38]–[41]. These initiatives have maintained the focus primarily on artifacts, archaeological sites, historic buildings, and cultural spaces as visual objects. A transformative digital oral history includes narrators' voices, community memory, family archives, local testimonies and explanations within the social relationships embedded in cultural heritage that should be integrated into such projects. By amplifying the role of oral history, immersive technologies in Indonesia can transition away from the visual gallery and into educational spaces that invite tradition bearers, heritage custodians, families working for collective memory, and local communities as active agents.

3.4 Preservation of Digital Heritage and the Authenticity of Cultural Representations

Digital heritage preservation means not just the preservation of objects. It is always a matter of the way historical resources are managed, of what their historical context looks like, of access granted, and of the preservation of cultural meaning. AR-enabled books on intangible heritage show that preservation becomes stronger through content

that involves people recognizing cultural practices [46]. In contrast, research on ephemeral heritage proves that potentially lost cultural practices may be restored through installations, archives, and digital media [47]. The construction of integrated digital journeys between sites broadens the concept of preservation as users not only observe objects but also explore the connections between locations, narratives, and experiences [48]. Such a knowledge network model aids in the effectiveness of preservation functions, for cultural knowledge can be linked through metadata, relationships between objects, community narratives, and societies [49].

Digital heritage is authentic when capturing the object visually and in the traces that it makes of sources, social context, and the cultural meanings associated with it. In this regard, virtual museums can present objects that seem similar to their offline form, but without the social context, community memory, and curatorial processes, the representation of objects is incomplete. Since virtual heritage studies often involve tracing sources, accommodating different interpretations, and enhancing the users' understanding of cultural artifacts [15], authenticity is well understood in the context. Studies of the metaverse reveal problems with digital preservation as well as more general economic costs, system sustainability, technological interoperability, and whether and how cultures are presented [26]. Therefore, digital preservation should promote technological progress and engage source transparency, responsibility as stewardship, and involvement of communities of the cultural heritage.

As such, this digital preservation has ethical dimensions, as preservation concerns not only what remains of an artefact, but also of human voices, lifeworld, stories, and testimony. Computational approaches to oral history archives show that digital technologies can streamline the retrieval, categorization, and evaluation of audiovisual assets [7]. Notwithstanding, these technologies run the risk of taking spoken testimony solely to text with a fine-tuning of the interview's context as a narrative device when the expressions, pauses, emotions, and social relationships of the narrator are overlooked. A multimodal approach highlights that digital oral history archives need to preserve spoken words and vocal expression, emotion, contextual information, and the narrator–interviewer relationship [8]. Affective listening builds on this idea by situating digital archive users as ethical listeners who bear responsibility toward the testimonies rather than just consumers of data [9].

The principal implication of this inquiry is to move away from how objects are kept towards who determines their meaning, who governs access, and who is authorized to revisit their representation. This is important because transferring oral history archives into virtual museums without the narrators' informed consent, source annotation, or mechanisms for community review can lead to the extraction of community memory. As such, digital preservation embedded within immersive digital oral history must be contextualised as a curatorial, ethical, and pedagogical practice. Preservation must not only ensure the long-term sustainability of historical sources, but also protect the relationships among voices of narrators, the social contexts in which narrators speak, rights of community members, and the teaching and learning of history.

3.5 Immersive History Learning and Strengthening Historical Thinking

Immersive technology might have a place in contextualizing history education and cultural heritage. The value of VR, AR, XR, and the metaverse is found in the visualization of historical environments and in learning scenarios that engage historical materials, interaction, and historical reflection. For instance, the Digital Oral Histories for Reconciliation proved that VR can present testimony as a vehicle for reconciliation learning when social and historical narratives are put into language [10]. Investigation of VR for exploring intangible cultural heritage suggests that immersive learning increasingly integrates space, action, and cultural knowledge into a contextual learning [19]. Similarly, collaboration through collaborative history education research on digital materials has shown that students would be more likely to construct a historical understanding if they co-construct historical stories [20]. Historical and cultural heritage AR applications also allow such learners to visit historical objects, places, sources, and narratives [21].

These concerns are backed by this systematic review, which illustrates how immersive technologies gain traction as relevant in the context-bound teaching of history and cultural heritage. Applying XR as a historical resource places VR, AR, and MR as media to emphasize place, experience, and interactive learning [22]. It still attracts reviews in relation to VR in history education and how it can engage students in the exploration of historical sources comprehensively [23]. Research linking VR to SDG 4 highlights that to embed immersive technologies in education, teachers have to introduce them well, which requires adequate infrastructure and institutional support [24]. To Indonesian students, VR applications inspired by local history can provide a further arena to develop their historical enquiry skills, provided that they can interact with original digital information sourced from authentic historical materials.

The results demonstrate that user engagement in virtual environments does not necessarily engender historical thinking if one has a critical perspective on the pedagogical theme. In a virtual space, students may feel an intense presence yet overlook the evidentiary basis of historical claims, competing interpretations, the positionality of narrators, or the contexts in which historical sources were produced. Therefore, the immersive learning experience should originate from structured historical thinking. Oral history also positions students to regard audiovisual sources as historical evidence that should be heard, questioned, compared, and interpreted in suitable contexts [6]. In the same vein, the principles of history education require students to comprehend historical significance, analyze historical evidence, explore different angles of thought, assess causation, study continuity and change, find ways of linking one era to another, and think ethically about interpreting history [4].

The results call for a paradigm shift in immersive technology-based learning—away from limited exploratory experiences and towards processes of historical inquiry designed to engage. Immersive media should not just be examined on metrics like user experience, perceived presence, or ease of use. Rather, assessment should center on students' ability to compare individual testimonies with archival sources, identify represented and hidden voices, explain narrators' positionality, evaluate the limitations of historical sources, and build evidence-based historical arguments. A student-centered oral history approach, which emphasises interpretation of history, coheres with these aims by establishing learners as interpreters of historical

sources and constructors of meaning, not as passive recipients [11]. Accordingly, evaluations of immersive learning should examine whether students can assess the validity and credibility of historical evidence, interpret multiple perspectives, demonstrate historical consciousness, communicate evidence-based arguments, and engage in ethical reflection on human voice representation in digital realms.

These results make a significant contribution to history education in Indonesia. Classroom projects can begin with relatively simple activities, such as interviewing local community members, examining local historical documents, collecting family photographs, creating community memory maps, and developing virtual exhibitions based on available historical sources. Indonesia's rich tradition of oral history can facilitate the discovery of social experiences often absent from official archival records [35]. Archival perspectives can support schools in responsibly managing historical documentation, metadata, access, narrators' informed consent, and long-term data preservation [36]. Through this approach, immersive technologies can evolve beyond serving as presentation tools to become learning environments that foster critical engagement with historical sources, cultivate historical empathy, and strengthen ethical responsibility in historical representation.

History education increasingly calls for the meaningful integration of immersive technologies. Their educational value lies not in the technologies themselves but in their capacity to deepen students' historical thinking. Visual experiences should raise questions about historical sources, digital interactions should support the evaluation of evidence, and virtual narratives should enable multiple interpretations and historical debate. In short, history education extends beyond virtual tours to become a historical inquiry that engages with human voices, community memory, and ethical reflection on how the past is represented.

3.6 Participatory Narrative as a Bridge to Immersive Digital Oral History

Participatory narratives are the closest conceptual bridge to immersive digital oral history. Research on collaborative digital storytelling suggests this kind of history learning can occur through the collective construction of historical narratives [20]. The fundamental ethics of shaping history and culture are that the game components should retain historical fidelity over entertainment. Similarly, AR applications could incorporate participatory activities in which users can actively participate in historical artifacts, locations, and cultural narratives [31]. AR and VR-based gamified applications also showcase that in addition to preservation, these cultural heritage efforts can be incorporated with metaverse environments and user-centered immersive experiences [32].

These findings also find validation in studies using cinematic VR to tell the narratives of Indigenous peoples. This work demonstrates that immersive spaces should recognise the importance of a range of community traditions of narrative as a storytelling format and not be restricted by a single narrative style [50]. Moreover, digital storytelling is more than an act of communication. It determines whose voices are represented and how stories are organised, which perspectives are centred and how access to those narratives is mediated. Decisions like these determine whether or not we view communities as an active part of the production of history or as objects of historical portrayal.

An examination of the theme points to two alternate futures. Digital storytelling can sometimes be a bridge to oral history when it allows the user the chance to hear the human voices behind objects and cultural artifacts of yesteryear. Narrative, however, is also risky when testimony is reduced to a sound effect, an emotional device, or one element of gamification. The risk is compounded in such cases when narrators are removed from the decision-making process of deciding which story should be told and in what terms testimony becomes accessible.

Participatory narratives, hence, should be produced with informed consent, community involvement, and acknowledgement of culturally and personally sensitive memories. The narrative theme is also relevant and implies that for digitally created oral history that is immersive, storytelling can no longer simply be about making stories for communities but must now begin with making stories with communities. Narrators should engage in the beginning and the choice of stories, the choice of digital objects, the structure of online communications, and the assessment of the representations generated. From the perspective of historical education, this practice encourages students to see history as more than mere information — it is also the collective expression of the intersection between historical evidence, lived experience, shared memory, and ethical responsibility.

3.7 Opportunities, Limitations, and Critical Implications for Immersive Digital Oral History

The opportunities, limitations, and critical implications of oral history significantly impact the development of oral history. The opportunity lies in the intersection of immersive environments, resource preservation, history education, and participatory ethics. The study of the metaverse allows the improvement of public access, educational processes, and user engagement [26]. Research on XR technology explains the need for standards, architecture, and experience design [27]. The study of the metaverse in the context of intangible cultural heritage appreciates cultural dissemination and active engagement [28]. However, these three opportunities only have meaning in history education when linked to the voice of the narrator, oral archives, and historical thinking. Table 4 presents a conceptual framework for IDOH-P, or Immersive Digital Oral History for Participatory History Education. It denotes a conceptual term to emphasize the experiential environment, digital storage, history education, and participatory ethics for a comprehensive history education.

Table 4. IDOH-P Framework for History Education.

Component	Primary Function	Design Question
Experiential Environment	Creates experiences of space, objects, sound, and interaction through VR, AR, MR, XR, or the metaverse.	Do users understand which elements are based on authentic evidence, hypothetical interpretation, or reconstruction?
Digital Preservation	Manages archives, artifacts, metadata, transcripts, photographs, and narrative contexts in an accessible and sustainable manner.	Are historical sources, interpretive boundaries, and curatorial decisions presented transparently?
Historical Pedagogy	Connects immersive experiences with evidence, multiperspectivity, argumentation, and ethical reflection.	Do learners compare narratives with historical sources and develop their own interpretations?
Participatory Ethics	Ensures consent, narrators' rights, community review, protection of sensitive stories, and shared authority.	Are communities involved from story selection through to the evaluation of digital representations?

The framework is more specific than technology mapping. The problem is not simply the lack of use of technologies such as VR, AR, XR, or the metaverse in history learning, but the lack of strong integration between these technologies and the ethicality of testimony, narrative ownership rights, archival context, and evidence-based learning. Therefore, the IDOH-P unites four elements as a whole. The experiential environment provides a learning space. Digital preservation safeguards sources and context. Historical pedagogy guides learners in critically examining historical sources, and participatory ethics protects narrators and communities.

In the metaverse and digital heritage cluster, it is crucial to understand the potential for preservation and public access while also addressing their limitations. Metaverse applications face various challenges such as authenticity, cost, interoperability, and sustainability [26]. Heritage education based on metaverse or XR technologies requires stable technical standards and architectural design [27]. Strengthening intangible cultural heritage through the metaverse must also ensure that interactive experiences do not separate cultural practices from the communities that own them [28]. Therefore, immersive technology cannot be considered the sole answer. It must be integrated into a clear and concise social, curatorial, and pedagogical design.

A crucial conclusion for history education is its emphasis on the connection of local memory with historically minded attitudes. Students face personal experiences through interviews and analyze testimonies in archives. By virtual exhibitions, they create representations, and through consideration, they assess the levels of their understanding and the accompanying ethical responsibilities. In this regard, the sequence provides an immersive digital oral history that not only stimulates students to reminisce nostalgically, but also helps them responsibly construct historical knowledge.

One important result is that technology development should be based on a historical background. Value, evidence, and learning objectives must not be disregarded in any knowledge related to history, along with cultural heritage [30]. Activities, such as those in participatory AR technology, need to create interactive spaces that will not reduce the community to a mere cultural background [31]. AR or VR applications in the metaverse should extend preservation, but still need clear sources and context [32]. Thus, the use of immersive digital oral history media is about more than introducing new technology. This model links human testimony, shared community memory, digital archives, virtual reconstructions, and reflective learning experiences.

History teachers need to motivate students to become source processors rather than mere spectators. Other possible activities might start from oral history interviews with the residents, followed by transcription, image annotation, archival reading, story mapping, and virtual exhibition creation. The prevalent studies in Indonesia on oral history and keeping records form the basis of such a model [35], [36]. Teachers can then assess the quality of the arguments made, the narrator's awareness and the students' ability to link personal experience and the larger historical narrative.

Albeit the results, the sources and forms of data in this study were quite limited. Available data are Scopus and Web of Science data only; hence, there is insufficient representation of local literature, community reports, museum archives, school teaching materials, local exhibition documentation, and unindexed oral history projects. Moreover, metadata-based keyword mapping cannot substitute for reading the full text. As such, the research results are a conceptual synthesis that does not refer to a definitive reference for all immersive digital oral history practices, but indicates the essentials for future studies. Further research should resort to local museums, community archives, school documents, and grassroots oral history activities, so that the study maps not only the indexed literature.

The application of the IDOH-P learning framework is exemplified by the development of the Metaverse Online Navigation Application (ANOM), which focuses on the prehistoric culture of Mantewe in Tanah Bumbu, South Kalimantan, Indonesia. ANOM provides an immersive learning experience through a metaverse-based learning trajectory that incorporates Augmented Reality (AR), documentary materials, games, and 360-degree virtual environments. Within the IDOH-P framework, this digital environment is enriched by narratives from local communities. Students can explore the origins of site names, such as “Liang Bangkai,” learn about community interactions with the sites, and examine the cave paintings found in the area. The information obtained from these narratives can then be verified against archaeological field data, research reports, maps, photographs, and scholarly studies. In this way, local narratives do not replace archaeological evidence but instead serve as complementary sources that deepen students’ understanding of the prehistoric cultural landscape of Mantewe and help explain the relationship between archaeological sites and the collective memory of local communities. By comparing community narratives with archaeological evidence, students can distinguish among scientific data, collective memory, historical interpretation, and digital reconstruction. This approach demonstrates how immersive digital oral history can provide a learning environment that integrates archaeological evidence, local knowledge, digital cultural heritage preservation, and a participatory, multi-perspective approach to history education.

4 Future Research Agenda and Further Research Trends

The next step for research to move beyond media testing should be focused on history learning. To date, numerous studies focused on the perception of users towards the presence, satisfaction, or ease of use of a product or service. Nevertheless, it is not enough to meet the needs of history education. Future research needs to assess students’ ability to produce arguments, distinguish between evidence and interpretation, understand a narrator’s voice, and recognize uncertainty in representation. Such assessment instruments can engage the frameworks behind oral history and the concept of multimodal digital oral history [6], [8]. Future evaluation will need to merge historical thinking rubrics, the analysis of individual student tasks, written reflections, and assessment of the curation process so that the influence of technology can be felt in ways other than user satisfaction.

The next potential is constructing immersive and participatory digital oral history models. Those projects should start not with questions of which technology is the most advanced, but with who has memories that need to be heard and how their communities want to be represented. The principles of distance oral history, digital consent management, and community archives form the basis of ethical design [12]. Research in the Indonesian context needs to determine if citizen interviews, family archives, and virtual exhibitions can enhance the teaching of local history [35], [36].

Another pertinent issue is the creation of ethical guidelines for the use of voices, facial images, avatars, family archives, and sensitive testimonies within immersive environments. While immersive technologies can raise accessibility, they also place participants at risk of misusing and distorting personal memories. Narrators must know how their voices will be used, who will have access to them, whether their testimonies may be transformed into avatars, and why certain stories can and cannot be made publicly available. Analyses of affective listening and student-centered oral history have shown that ethical responsibility extends beyond data gathering and encompasses listening, presentation, and use of testimony [9], [11].

Future studies should pay more attention to disparities in digital access. Not all schools have access to VR equipment, reliable internet connectivity, or adequate technical support. Research should not just focus on the introduction of high-cost technologies. It should also build scalable and accessible models based on smartphones, 360-degree virtual tours, lightweight virtual exhibitions, and community-based audio archives. Studies about the use of VR for teaching local history and virtual reality in relation to SDG 4 revealed how the educational value of VR is contingent on the compatibility of immersion with the school environment, teacher readiness, and long-term institutional support [24], [25].

5 Conclusion

This systematic review showed that the research on immersive technologies in cultural heritage, virtual heritage, digital heritage, and digital storytelling has witnessed a remarkable increase since 2021. Of 154 records identified, 123 documents were used in a systematic synthesis, and a descriptive bibliometric analysis was carried out for 122 Scopus-indexed publications. The burgeoning studies published on this topic, across different countries in geographical scope, focus on users of such technologies throughout the globe. Moreover, diverse sources of publication across different fields show that immersive technologies have become a major focus of cultural heritage preservation. Nevertheless, this attention has not yet fully included history education that prioritizes voice, memory, and historical representation ethics.

This review underlines four major findings: immersive technologies and experiential environments, digital heritage preservation and authenticity, history education and pedagogical interaction, and digital storytelling and participatory narratives. More importantly, oral history has not been sufficiently situated as a central node in the knowledge network. This indicates that research in areas such as VR, AR, XR, the metaverse, and digital heritage should be more specifically connected with the ethics of testimony, narrators' rights to recognition, digital archives, and community memory.

Immersive technologies have never been conceived simply as mechanisms to visualize cultural heritage. In history lessons, these technologies should thus also become participatory spaces that weave together a multitude of evidence, voices, ways of remembering, and forms of interpreting history. Interrelated dimensions of the IDOH-P framework involve the experiential environments, the digital preservation of history education, and participatory ethics. In short, immersive digital oral history can help to democratize historical knowledge, facilitate historical thought, and make sure that narrators and communities are still the main storytellers of past events. Finally, this study engages with the framing of immersive digital oral history as an ethical, pedagogical, and participatory space through which the people behind archives, cultural objects, and reconstructions of the past can be brought back to the reader's attention.

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