



Metaverse in Education: Prospects and Its Impact on History Teaching - A Systematic Review

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ABSTRACT

Research on the metaverse has largely focused on general technological development and its application in education. However, systematic reviews specifically examining the use of the metaverse in history education remain limited. This study aims to examine the directions, strategies, and reported impacts of metaverse development in history education. A systematic literature review was conducted using the framework proposed by Petticrew and Roberts, consisting of seven stages: refining the research question, determining inclusion and exclusion criteria, conducting a literature search, assessing study quality, synthesizing evidence, exploring study heterogeneity and potential sources of bias, and disseminating the findings. The review followed PRISMA guidelines, with literature searches conducted in the Scopus and ScienceDirect databases for studies published between 2019 and 2024. From 119 identified articles, 10 studies met the inclusion, relevance, and quality assessment criteria and were selected for in-depth analysis. The findings indicate that research on the metaverse in history education has employed development, qualitative, quantitative, and mixed-methods approaches. The reviewed studies show that metaverse-based history education has the potential to enhance students' engagement, motivation, historical understanding, and historical thinking skills through immersive, interactive, and contextual learning environments. The metaverse can support history learning by presenting historical spaces, events, and narratives in ways that encourage inquiry, interpretation, contextualization, and critical reflection. However, the reviewed studies varied in research design, learning context, platform, participants, and outcome variables, making a statistical meta-analysis unsuitable. Therefore, this review provides an exploratory thematic synthesis of current research trends and highlights future directions for the development of metaverse-based history education.

KEYWORDS

Metaverse; history teaching; learning system; media education; virtual learning.

INTRODUCTION

The rapid development of digital technology has transformed educational practices across different fields. The COVID-19 pandemic further accelerated the use of online learning platforms and encouraged educators to adopt technology-supported teaching methods (Nel et.al., 2021; Marais, 2021). In this context, the metaverse has emerged as one of the most promising technologies for creating immersive, interactive, and flexible learning environments (Aslan, 2021; Park & Sohn, 2023; Tai, 2023).

The metaverse has become one of the most widely discussed technologies in the world. Beyond its applications in the field of technology itself, the concept of the “metaverse” first appeared in Neal Stephenson’s 1992 novel *Snow Crash*. The novel defines a “meta-universe” as a joyful, interactive digital world constructed as a three-dimensional virtual space (Joshua, 2017).

The metaverse is a three-dimensional, shared, interactive digital environment where many users can interact simultaneously. This environment is immersive and persistent, meaning it continues to exist even when users are not actively present (Mystakidis, 2022). In the field of education, metaverse technology can be implemented through a combination of artificial intelligence (AI), augmented reality (AR), virtual reality (VR), and mixed reality (MR). By integrating the physical and digital worlds, these technologies can enhance innovation and creativity (Akyürek et al., 2024; Dwivedi et al., 2022; Galindo-Manrique et al., 2024; Johri et al., 2024; Singh & Singh, 2024).

Based on Government Regulation No. 57 of 2021, Article 40, the curriculum must be developed in line with advances in science, technology, and the arts. This is also based on Law No. 14 of 2005, which states that teachers and lecturers must be able to develop knowledge, technology, and the arts. Therefore, educators must always adapt and improve their digital competence (Claro et al., 2024).

In line with these requirements, history teachers and lecturers must be able to develop and use a range of technologies in their teaching. The integration of the metaverse in history education should align with the goals and functions of history learning. National history education aims to realize national ideals across all sectors, to foster an interest in studying the nation’s history as part of world history, and to cultivate national historical consciousness. Students should develop historical thinking skills, as well as an attitude of appreciation, critical reflection, and empathy toward the nation’s developmental processes, and a love for their homeland (Kochhar, 2008; Susanto, 2014; G. Widja et al., 2009; Wineburg, 2006). History education serves as an intellectual depiction, a means of self-recognition as part of a nation, and a repository of problem-solving examples for addressing challenges in the present and the future (Chimbunde et al., 2023; Hasan, 2019; Oliva, 1982; Stearns et al., 2000).

According to Sarnita Sadya & Dimas Bayu (2023), Indonesia ranks as the fifth-highest country in the world in terms of metaverse usage. This indicates that the potential for metaverse adoption and student readiness can be progressively developed in Indonesia. The development

of metaverse technology in history education can serve as a “historical space,” as proposed by Cooper (1995), in the form of a virtual world. Recently, the use of the metaverse has become a popular and engaging topic of education research (Çelik & Baturay, 2024; Lin et al., 2022; Maghaydah et al., 2024; Shwede, 2024). Many studies have examined the concept of the metaverse, focusing on technical reviews, the history of the metaverse, artificial intelligence, and its applications and development in education (Li & Li, 2024).

Research on the metaverse across various fields, however, remains in its early stages, meaning that the metaverse still holds great potential for future, gradual development in multiple directions through the analysis of existing challenges. These findings highlight an important opportunity that research on the metaverse in the field of history education should be pursued further. The development of metaverse-based learning must align with the objectives of the current history education curriculum, taking into account the characteristics and goals of history learning. Park & Sohn (2023) state that platforms such as Webex and Gather Town can be used to implement metaverse-based learning in art history education at the university level. This topic is important for defining the direction of metaverse development in history learning, particularly in changing the public perception that studying history is only about memorizing past events, irrelevant to the present. Through the metaverse, history can be presented in a contemporary, meaningful way that addresses real-life societal needs. More specifically, the metaverse can address the low level of historical literacy and the dominance of rote learning by transforming history learning from passive memorization into active, contextual, and experiential inquiry. In a metaverse-based historical learning environment, students are not only asked to remember names, dates, and events, but are also encouraged to explore reconstructed historical spaces, interact with historical narratives, examine causes and consequences, and connect past events with present social realities. Through immersive simulations, virtual historical sites, interactive timelines, and collaborative role-based activities, learners can develop historical thinking skills such as chronological understanding, source interpretation, causality analysis, empathy, and critical reflection. Therefore, the metaverse offers a pedagogical pathway to improve historical literacy by enabling students to experience history as a meaningful process of inquiry rather than as a collection of facts to memorize. This makes metaverse-based history education relevant not only as a technological innovation but also as a response to fundamental problems in history learning.

Research on the metaverse in education has been widely published from various perspectives, including specific educational theories, methodologies, research paradigms, and explorations of its applications in education. However, studies that specifically focus on history education remain relatively rare. This presents an opportunity to establish a research direction informed by relevant literature to identify future development pathways for the metaverse in history education, an area that warrants further investigation.

Many articles on the metaverse can be found across various fields; however, most discuss the general direction of metaverse research in education, focusing on developments in four

main countries: Singapore, Japan, China, and the United Kingdom (Bizel, 2023). Another study by Chen et al. (2023) presented a systematic review of the metaverse in education based on three main keywords: teaching, application, and metaverse, whereas concepts such as instructional approaches, knowledge, and challenges have not yet been explored in depth.

Most existing analyses employ bibliometric methods using software tools such as VOSviewer and CiteSpace, for example, in the field of education (Chen et al., 2023). Research analyzing the metaverse in education has largely drawn data from publications in 2022 and early 2023 (Bizel, 2023; Chamorro-Atalaya et al., 2023; Chen et al., 2023). However, studies on the metaverse in education have shown rapid growth during late 2023–2024 across various countries. Therefore, it is crucial to conduct an updated analysis on the direction of metaverse development in history education. Moreover, there has not yet been a comprehensive analytical study specifically examining the use of the metaverse in history education.

Unlike previous research that examined the metaverse more generally, this article systematically reviews the literature, specifically in history education, to fill this gap by providing evidence-based analysis of strategies for developing the metaverse in this field. Based on research trends on the metaverse in education, this article offers recommendations for directions in which the metaverse should be developed in the field of history. This systematic review aims to identify the direction of metaverse development and its impact on history education. The topic of metaverse media in history education has high potential for continued applied research in Indonesia. Thus, this review can contribute strategies for developing and utilizing the metaverse in history education, addressing questions such as: How can history learning environments be appropriately integrated with the metaverse? How prepared are institutions, teachers, and students for implementing metaverse-integrated history instruction? How can historical materials be developed to integrate with the metaverse? What metaverse products and platforms can be used and further developed in history education? Moreover, what are the impacts of using the metaverse in history education?

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The metaverse refers to a persistent, interactive, three-dimensional virtual environment where users can interact with digital objects and other users through avatars. In education, the metaverse combines virtual reality, augmented reality, mixed reality, and digital platforms to create immersive learning spaces that connect real and virtual experiences (Prieto et al., 2022; Rospigliosi, 2022; Sabbah et al., 2025; Suzuki et al., 2020).

The outbreak of the COVID-19 pandemic has increased interest in using the internet for educational purposes, including the use of the term “metaverse” in education (Kaddoura & Al Hussein, 2023). López-Belmonte et al. (2023) state that the metaverse is a computer-generated 3D virtual environment that enables users to interact with others and digital objects, thereby eliminating the limitations of distance and time. This concept has the potential to enrich and transform education, particularly by increasing student engagement and motivation.

This potential can be realized through blended learning, combining online and offline learning experiences to provide a more personalized and flexible learning environment (Darmawan et al., 2025; Zhang et al., 2022). The use of the metaverse in education is still in its early stages. It requires further research to understand better its benefits and how it can be applied across different subjects and levels of education (López-Belmonte et al., 2023).

Kye et al. (2021) define metaverses in terms of three essential components: hardware, software, and content. Furthermore, Hwang & Chien (2022) describe three approaches to understand metaverses: user interaction, implementation, and application. Metaverses enable the simulation and creation of realistic learning scenarios through modeling and rendering technologies, including digital twins, VR, AR, and XR (Davis, 1989; Duan et al., 2021; Lv, 2023). Metaverses in education can recreate 3D environments, such as real classroom floor plans, partially or completely, depending on the designed learning content, especially activities that are not easily visible in the real world, such as those that can be constructed in the virtual world. For example, outer space, oceans, forests, history, websites, and more (Prieto et al., 2022). Beyond science, the metaverse also offers significant potential in humanities learning, particularly in history education.

In the context of history education, the metaverse should be understood not only as a technological learning environment but also as a medium for constructing historical space and supporting historical thinking. Historical space refers to a learning environment in which students can encounter, explore, and interpret the past through spatial, visual, and experiential representations. Through reconstructed historical sites, virtual museums, digital archives, and immersive historical simulations, the metaverse enables students to engage with history as a situated and interpretive experience rather than merely as written information. This is important because learning history requires students to understand the relationships among people, places, events, time, and historical evidence.

Theoretically, the use of the metaverse in history education is closely related to the development of historical thinking skills. Wineburg (2006) argues that historical thinking requires students to move beyond memorizing facts and to examine the past through inquiry, interpretation, contextualization, and critical evaluation of evidence. In this sense, the metaverse can support historical thinking by allowing learners to observe historical contexts, compare multiple perspectives, analyze cause-and-effect relationships, and reflect on the meaning of historical events. For example, when students enter a virtual reconstruction of a historical site, they can investigate historical sources, identify actors and events, discuss different interpretations, and connect past conditions with present realities. Thus, metaverse-based history learning can strengthen chronological thinking, historical comprehension, source analysis, contextualization, historical empathy, and reflective judgment.

Therefore, the metaverse provides a theoretical bridge between technology-enhanced learning and the pedagogical goals of history education. It can function as a historical space where students actively construct historical understanding through exploration, interaction,

and interpretation. This framework shows that the metaverse is not merely a digital visualization tool, but a learning environment that can help transform history education from rote memorization into inquiry-based historical learning.

The presence of the metaverse presents a significant opportunity for innovation in history education. Referring to various explanations of the metaverse in education, Zhang et al. (2022) outlined various research opportunities for the metaverse in education, including: 1) designing a metaverse model or framework for educational purposes; 2) establishing clear rules based on metaverse principles in education; 3) investigating the attitudes of school administrators, teachers, and parents toward the use of the metaverse for educational purposes; 4) providing professional development for teachers related to the metaverse; 5) exploring the cognitive, affective, and psychomotor impacts of the metaverse on student learning; 6) comparing the effectiveness of learning with the metaverse and other learning environments with different metaverse platforms; 7) generating new ideas about methodological and pedagogical models aligned with the metaverse; 8) discussing existing pedagogical theories for metaverse-based education; and 9) developing an educational assessment framework based on the metaverse or by using the metaverse as a learning tool.

METHOD

The research method used in this article was the Systematic Literature Review (SLR). According to Petticrew & Roberts (2015), this method consists of seven procedures: 1) refining the research questions and defining the scope; 2) determining inclusion and exclusion criteria for the review; 3) conducting a comprehensive literature search; 4) assessing the quality of the studies; 5) synthesizing the evidence; 6) exploring study heterogeneity and potential sources of bias; and 7) disseminating the review findings.

Refining the Research Question and Defining the Scope

This systematic review research has specific limitations. The research question (RQ) is: How are the strategies and directions for the development of the metaverse in history education from 2019 to 2024? The review protocol includes the research question (RQ), search process, inclusion and exclusion criteria, quality assessment, data extraction, and data synthesis. The RQ was used to define the scope and limitations of this research. Furthermore, it was formulated using the PICO framework, as detailed in Table 1 below.

The main objective of this systematic review research is to collect and analyze relevant evidence to answer the RQs. The purpose of addressing the RQ is to deepen understanding of the importance of research direction and to expand knowledge of the metaverse's potential in history education, implementation strategies, and impacts. This understanding can help determine future research opportunities. The RQs also aim to explore how policymakers can develop appropriate curricula and strategies for selecting history learning materials, identifying supporting technologies, and creating suitable learning environments. Therefore, the research

question (RQ) of this review is: How are the directions, strategies, and impacts of metaverse development in history education?

Table 1.

PICo Criteria

PICo Criteria	
P = Population	: Metaverse in history education
I = Intervention	: Strategies for developing the metaverse in the field of history education
Co: Context	: Studies on the metaverse in history education at secondary schools and higher education institutions

In this review, the term “impact” refers to the reported effects of metaverse-based learning on several educational variables relevant to history education. These variables include students’ learning achievement, engagement, motivation, attitudes toward history learning, historical understanding, and historical thinking skills. Historical thinking skills in this context include chronological understanding, interpretation of historical evidence, contextualization, causal reasoning, historical empathy, and reflective judgment. Because this study is a systematic literature review rather than an experimental study, the term “impact” does not refer to a single dependent variable measured statistically across all studies. Instead, it refers to the range of learning outcomes and educational effects reported in the selected articles. Thus, the analysis of impact focuses on how metaverse-based learning contributes to cognitive, affective, and historical-thinking dimensions in history education.

Determining Inclusion and Exclusion Criteria

Table 2.

Inclusion and exclusion criteria

Inclusion Criteria	Statement	Exclusion Criteria
Timeline	Between 2019-2024	Before 2019 there was no research results on the metaverse yet
Document Type	Research article	Article review, book, proceeding
Language	English	Non- English
Source Type	Journal	Non-Journal
Indexing	Scopus	Non-Scopus

The stage of determining the inclusion and exclusion criteria for the review was conducted manually using parameters defined by the author. Ten articles were selected for analysis. The selected time range was 2019–2024, as research on the use of the metaverse in education began around 2019, has continued to grow, and reached its highest level of development in 2024. Second, the documents considered were limited to research articles.

Other types of documents, such as books, review articles, and conference proceedings, were excluded because they are not considered primary sources. Third, language criteria were applied. Non-English articles were excluded to avoid potential difficulties in the analysis process. Fourth, indexing criteria were used. All articles not indexed in Scopus were excluded from the review. These criteria are summarized in Table 2.

Literature Search

The third process conducted in the systematic review was data identification. At this stage, keywords were used to obtain accurate and relevant information. The sources used to identify relevant keywords include dictionaries, keyword databases, literature sources, and Scopus-provided keyword suggestions for suitable synonyms. This stage yielded a total of 119 documents, comprising 48 from Scopus and 71 from ScienceDirect. The details are presented in Table 3 (see appendix).

Assessing Research Quality

The process of assessing research quality was conducted using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework. PRISMA is widely adopted in literature review processes due to its three distinctive advantages: a clearly defined and systematic research problem, the identification of inclusion and exclusion criteria, and the examination of large scientific databases over a specific period (Hong et al., 2018).

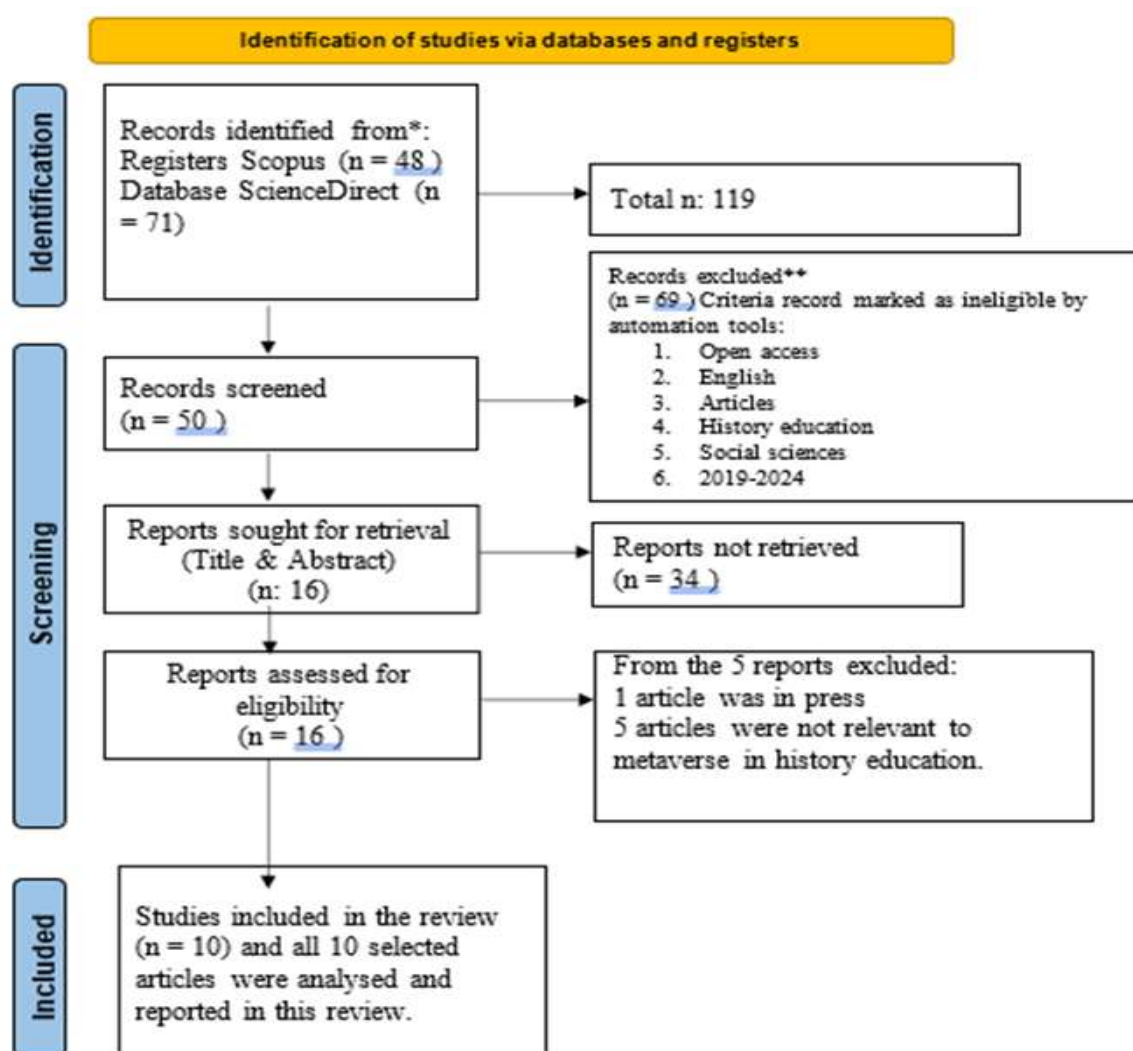
This review involves several phases: identification, screening, eligibility, quality assessment, data abstraction, and data analysis. In the next stage, the quality of the selected articles was evaluated and analyzed. Data analysis was conducted in line with the research focus. Each article was carefully examined to determine the potential, benefits, and impacts of the metaverse in history education. In addition, the research methods used, whether qualitative, quantitative, or mixed methods, were analyzed. The study also examined research strategies and themes to identify relevant topics and trends in metaverse-related studies in history education. A total of 10 articles were analyzed in depth through the systematic review process, with research questions extracted and data coded from each article. At this stage, both the abstracts and full texts were used as valuable sources of evidence for identifying findings aligned with the research objectives, as illustrated in Diagram 1 below.

The quality assessment of the articles was conducted through a review by two experts in history education. At this stage, an evaluation of the selected research articles was conducted to ensure the validity and relevance of the findings. The assessment used the Mixed Methods Appraisal Tool (MMAT). According to Hong et al. (2018), this tool can be applied to various research designs, including qualitative, quantitative, and mixed-methods studies. The reduction from 119 identified articles to 10 for in-depth analysis was based not only on the general inclusion and exclusion criteria but also on a staged quality assessment process. First, duplicate and irrelevant records were removed during the identification and screening stages. Second, titles and abstracts were examined to determine whether each study explicitly discussed the metaverse or related immersive technologies in educational contexts. Third, the full texts were

assessed to ensure that the articles had a clear connection with history education, historical learning, social studies, humanities education, or learning environments relevant to historical understanding. Fourth, methodological quality was evaluated using MMAT criteria, including the clarity of research objectives, appropriateness of the research design, adequacy of data collection procedures, relevance of data analysis, and coherence between findings and conclusions. Articles were excluded if they discussed the metaverse only in the context of general education, without relevance to history education; lacked empirical or conceptual depth; did not provide sufficient methodological information; or did not present findings on learning strategies, development directions, or educational impacts. Therefore, the final 10 articles represented studies that met both the topical relevance criteria and the methodological quality requirements for answering the research questions.

Diagram 1.

PRISMA 2020 flow diagram



Synthesizing Evidence

Based on the analysis of the reviewed articles, evidence synthesis was conducted to integrate information from each study and provide a more comprehensive answer to the RQ informed by

previous research findings. The synthesis process involved data transformation and several phases: identifying patterns within the data, examining the quality of the synthesis, and integrating relevant findings to address the established RQ effectively.

Exploring Study Heterogeneity and Potential Sources of Bias

After obtaining data from the synthesis stage, the next step was to explore heterogeneity across studies and potential sources of bias descriptively. Because this review did not conduct a statistical meta-analysis, heterogeneity was not assessed using numerical indicators such as I^2 or Cochran's Q. Instead, heterogeneity was examined by comparing the selected studies with respect to publication year, country of study, research design, participants, learning context, type of metaverse or immersive technology used, and reported outcome variables. Potential publication bias was also examined descriptively by considering the distribution of publication years, journal sources, database coverage, indexing criteria, and language restrictions. This approach was used to identify possible limitations in the evidence base and to avoid overstating the generalizability of the findings.

Disseminating the Review

The dissemination process involved writing a research report on the metaverse in history education, which was then developed into a scientific article and published in a reputable journal. Through this dissemination, the review is expected to help shape new directions for metaverse development and inform policy decisions in history learning.

The next step involved processing the analysis results and visualizing the data with VOSviewer. VOSviewer (Visualization of Similarities Viewer, VOS) version 1.6.19 is a bibliometric analysis tool developed by Nees Jan van Eck and Ludo Waltman from the Center for Science and Technology Studies at Leiden University, the Netherlands. VOSviewer is a widely used tool in bibliometric and scientometric research for constructing and visualizing knowledge maps derived from literature data.

RESULTS

Based on the extraction and data analysis of 10 articles on the development of metaverse strategies in history education, the data were categorized by examining the characteristics of the selected articles, which then became the main findings of this review. The data were analyzed using thematic analysis.

General Findings and Thematic Review of Metaverse in History Education

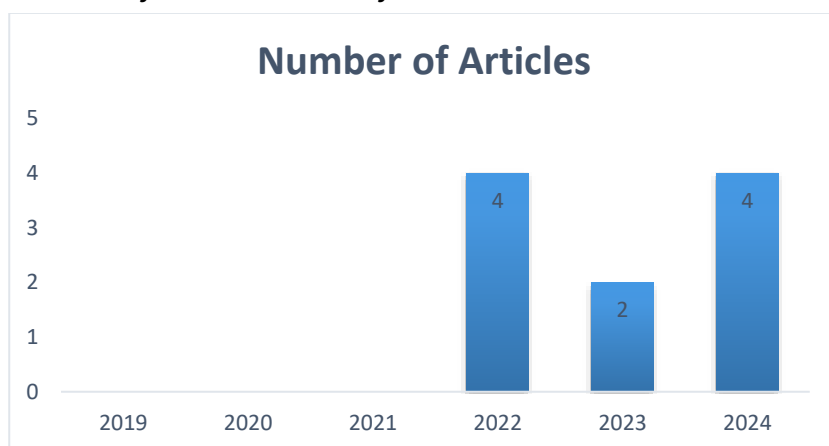
Table 4 (see appendix) presents the distribution of the 10 selected articles. Table 4 provides general information, including the authors, year of publication, journal title, and publisher. All the articles used in the analysis process were obtained from international journals indexed in Scopus.

Based on Table 4, which presents the ten selected articles, general information is provided regarding the authors, year of publication, journal, and publisher. All analyzed articles were published in international journals indexed by Scopus. In general, among the selected

articles, three were published by the Multidisciplinary Digital Publishing Institute (MDPI), two by Elsevier Ltd., one by Taylor and Francis Ltd., one by the Institute of Advanced Engineering and Science, one by IGI Global, one by Universitas Negeri Semarang, and one by John Wiley and Sons Inc. Furthermore, the publication years of these articles range from 2019 to 2024, with most published in 2022 and 2024 (four articles each) and the remainder in 2023. This distribution is shown in Figure 1 below.

Figure 1.

Number of selected studies from 2019 to 2024



Based on the analyzed articles, the research focuses on eight countries: Spain, Greece, South Korea, the Russian Federation, Indonesia, China, Australia, and Türkiye. Based on the objects, Spain ranks first with two documents (A5 and A9), followed by Greece with two documents (A3 and A8), while each of the other countries contributed one document.

Table 5.

Distribution of Study Countries

Study Country	Number of Studies	Paper ID	Author(s)
Spain	2	A5, A9,	Corrales M et al; Sospedra-Roca R et al;
Greece	2	A3, A8	Papadopoulou A et al; Christopoulos A et al
South Korea	1	A7	Park J & Sohn S.
The Russian Federation	1	A4	Malysheva O et al
Indonesia	1	A2	Jamiludin J. & Darnawati D.
China	1	A1	Zhang X. & Wang X.; Lu J.
Australia	1	A10	Dwivedi, Yogesh K. et al
Türkiye	1	A6	Yildirim P & Kecici G.

Furthermore, the selected articles were analyzed in accordance with the research design employed. The methods used in the selected research articles include quantitative, qualitative,

design-based, and mixed-methods approaches. Table 6 shows that the most commonly used method is the quantitative approach (A9, A3, A4, and A8) with four documents, followed by three qualitative studies (A7, A1, and A10), one design-based research study (A6), and two mixed-methods studies (A5 and A2).

Table 6.

Summary of Research Design

Main Study Type	Number of Documents	Journal	Paper ID
Quantitative	4	Cogent Education; Information (Switzerland); Heliyon; Information (Switzerland)	A9; A3; A4; A8
Qualitative	3	Harmonia: Journal of Arts Research and Education; International Journal of Web-Based Learning and Teaching Technologies; International Journal of Information Management	A7, A1, A10
Design and Development Method	1	Journal of Computer Assisted Learning	A6
Mixed Method	2	Heritage; International Journal of Evaluation and Research in Education	A5; A2

The selected studies showed considerable heterogeneity. In terms of publication year, the reviewed articles were published between 2022 and 2024, with most articles appearing in 2022 and 2024. In terms of geographical distribution, the studies were conducted in eight countries, namely Spain, Greece, South Korea, the Russian Federation, Indonesia, China, Australia, and Türkiye. The research designs also varied, comprising four quantitative, three qualitative, two mixed-methods, and one design-based research study. This variation indicates that evidence on the use of the metaverse in history education remains diverse and emerging. Heterogeneity was also found in the learning contexts and reported outcomes. The selected articles examined different forms of metaverse-related or immersive learning, including virtual environments, digital heritage, immersive platforms, and technology-enhanced learning spaces. The outcome variables reported across the studies were not uniform. Some studies focused on learning achievement or performance, while others emphasized motivation, engagement, perception, learning experience, readiness, or the development of learning environments. Because of methodological and outcome heterogeneity, the findings were not suitable for statistical pooling in a meta-analysis.

Potential sources of bias were also identified. First, the review included only English-language journal articles indexed in Scopus, which may have excluded relevant studies published in other languages, in proceedings, in books, or in non-Scopus journals. Second, the evidence base was concentrated in a small number of publications from a few years and countries. Third, the final number of studies was limited to 10 articles, making it difficult to generalize the findings across all history education contexts. Therefore, the results of this review should be interpreted as an exploratory synthesis of current research trends rather than as definitive evidence of the metaverse's effectiveness in history education.

Main Findings of Thematic Analysis

This section describes the main themes identified in the selected articles analyzed. There are five major themes explored in this analysis, namely: (1) strategies for the development and utilization of historical metaverse, (2) metaverse environments in history education, (3) historical metaverse products, (4) readiness of institutions, educators, and students, and (5) historical subject topics for metaverse. The researchers' findings are illustrated in the following diagram.

Table 8.

Descriptive Summary of Quantitative Findings

Paper ID	Study Design	Reported Outcome Variables	Form of Reported	Impact	Effect Size Availability
A3	Quantitative	Learning experience, engagement, perceived usefulness, interaction	Positive effect on learning experience and engagement	reported and	Not calculated because comparable statistical data were not consistently available
A4	Quantitative	Achievement, learning performance, student perception	Reported improvement in learning outcomes and perception	in	Not calculated because statistical indicators were not sufficient for pooled analysis
A8	Quantitative	Motivation, engagement, usability, learning experience	Positive effect on motivation and engagement	reported and	Not calculated because measurement instruments differed from other studies
A9	Quantitative	Learning achievement, attitude, digital learning experience	Reported improvement in achievement and attitude toward learning	in and toward	Not calculated because outcome measures and intervention contexts were heterogeneous

Among the 10 selected articles, four studies employed quantitative research designs: A3, A4, A8, and A9. These studies were reviewed to identify the types of educational effects reported in relation to metaverse-based or immersive learning environments. However, the quantitative findings could not be combined in a meta-analysis because the studies differed in participants, learning settings, intervention characteristics, measurement instruments, and outcome variables. Therefore, this review does not present a pooled effect size. Instead, the analysis reports the direction and type of educational effects described in each study. The reported effects were grouped into several outcome categories, including learning achievement, engagement, motivation, attitude toward learning, learning experience, and historical or disciplinary understanding. This descriptive synthesis provides an overview of how metaverse-related learning may influence educational outcomes, while acknowledging that the strength of the effects cannot be statistically generalized across studies.

Table 8 shows that the quantitative studies generally reported positive educational effects. However, because the studies did not use comparable dependent variables or identical measurement instruments, the results were synthesized descriptively rather than statistically. Consequently, expressions such as “positive impact” and “improvement” in this review refer to effects reported within individual studies, not to a pooled effect size across studies.

DISCUSSION

Strategies for the Development and Implementation of the Metaverse in History Education

The strategies for implementing the metaverse in history teaching require thorough preparation to ensure effectiveness. The development of materials, the selection of products, the generation of ideas, and the application of technologies should all be carefully considered. The historical material on the Spanish Civil War was developed through the creation of virtual iconography using 3D and matte painting techniques. The strategy developed by Sospedra Roca et al. (2022) involves using static or kinetic images from historical reenactments to illustrate digital iconography in 3D form.

Teachers are required to understand technology and design a variety of interactive media within the metaverse to achieve meaningful history learning. It is important to design an interactive, in-depth virtual reality environment for history education that aligns with class needs and effectively explains historical events through authentic design (Christopoulos et al., 2024; Papadopoulou et al., 2024; Zhang et al., 2023).

A virtual simulation environment created using virtual reality and 3D technology can provide students with a long-term understanding. However, the implementation of virtual reality in history learning should be flexible and diverse, not limited to historical restoration, sequences, figures, or artifacts (Zhang et al., 2023), as such a limitation would only provide a surface-level understanding of history learning. Historical virtual simulations should instead provide a clear historical narrative. Through virtual simulation, students can experience historical events with an authentic atmosphere of the past.

Learning history with VR environments has transformative potential. Interactive e-books integrated with social virtual reality technologies can engage students' interest, promote active, enjoyable learning, reduce anxiety, and enhance enthusiasm compared to traditional teaching methods (Christopoulos et al., 2024; Chimbi & Jita 2021; Papadopoulou et al., 2024). The presentation of historical narratives should be clear, engaging, well-structured, and informative, so that the class can facilitate experiential learning in history through students' active involvement.

The use of VR technology provides a more comprehensible framework and an active environment aligned with scientific discovery methods (Sospedra Roca et al., 2022). Therefore, it is important to select appropriate strategies and user-friendly software. For example, when developing 3D figures, programs such as Blender, Daz Studio 3D, or Metahumans can be utilized.

Metaverse can be implemented through the integration of various learning media. Teachers have the opportunity to implement specific strategies by using available online platforms such as HeyGen to create introductory videos with character photos, artificial intelligence (AI) tools for content generation, Itch.io to host e-books, and Padlet as an interactive learning platform (Papadopoulou et al., 2024).

The strategies for developing the metaverse require careful consideration when designing virtual environments that align with students' needs, making the learning process more accessible and effective. The software should be used carefully to facilitate learning and enable students to modify and adapt the materials. The strategy applied by Park and Sohn (2023) involves designing the main building of Hongik University, paying close attention to real classroom details such as seating arrangements and blackboard placement. This approach allows students to experience an authentic virtual learning environment presented within the metaverse. Another applicable strategy is to construct a virtual museum by using resources and materials from other museums and relevant sources aligned with the learning content.

Metaverse Environment in History Education

Students' learning environments in studying history through the metaverse should be carefully planned. Teachers and lecturers need to examine the effectiveness of the metaverse in history education. Noisy surroundings, uncomfortable homes, unstable internet connections, and limited data access can lead to students' reluctance to learn history (Jamiludin & Darnawati, 2022). Therefore, schools and universities need to provide adequate learning devices, innovative teaching strategies, and sufficient history learning resources.

Besides designing the physical learning environment, the metaverse environment itself should also be designed based on the students' needs. By using the metaverse environment, history learning can become more effective, engaging, and accessible (Christopoulos et al., 2024; Yildirim & Keçeci, 2024). Through experiences in virtual environments, students gain visual and interactive exposure, enhancing their engagement (Papadopoulou et al., 2024; Park & Sohn, 2023; Yildirim & Keçeci, 2024). Consequently, students can more easily understand abstract historical concepts.

The user-friendly and comprehensive application interface allows both students and teachers to engage in more effective history learning (Christopoulos et al., 2024; Yildirim & Keçeci, 2024). It is essential to design a visual environment and provide map information on the application's main page. The metaverse environment should adopt historical settings to reflect the learning content being studied, using 3D animation (Yildirim & Keçeci, 2024). Additionally, an important aspect of digital media is its visual appeal. Therefore, it is suggested that detailed color harmony be used to enhance students' interest and motivation in learning history (Christopoulos et al., 2024; Yildirim & Keçeci, 2024; Zhang et al., 2023).

Careful planning in selecting the historical settings is also important. Digital iconographic products featuring themes such as World War or the Spanish Civil War should be represented and illustrated in accordance with their characteristics, using framing, shape, size, color, dynamic elements, and anthropic aspects. These depictions can also be developed based on realistic or hyper-realistic criteria (Sospedra Roca et al., 2022).

Metaverse Products and Platforms for History Education

Various metaverse products can be developed and implemented for history education. Virtual reality provides an immersive experience similar to visiting the actual locations (Corrales et al., 2024; Papadopoulou et al., 2024). The use of virtual reality solves several challenges in history education, including: 1) the abundance and diversity of historical content; 2) bridging multiple perspectives in understanding history; and 3) enhancing student engagement through exploration of historical narratives from different viewpoints and experiences, including controversial or distant historical events that are very different from students' lives (Papadopoulou et al., 2024).

Another application developed in the metaverse for history education is Augmented Reality, called TSAR-3D (Yildirim & Keçeci, 2024). TSAR-3D is equipped with both English and Turkish. This application helps students to gain a better understanding of historical content. This metaverse can enhance students' motivation and interest in the historical material being studied (Papadopoulou et al., 2024; Park & Sohn, 2023; Yildirim & Keçeci, 2024; Zhang et al., 2023). TSAR-3D also enhances historical and scientific awareness, thereby increasing students' confidence. In addition, it contributes to the development of various student skills, including research abilities, empathy, and more efficient use of study time.

Another product that can be developed is 3D virtual iconography, used to illustrate battlefields through panels, audiovisual materials, publications, historical content, applications, and guided tours, as well as augmented and virtual reality. 3D applications can be adapted and reassembled with historical materials. This can be done by recreating locations, combining human-made elements with images from historical reconstructions, and using matte paintings or video (Sospedra Roca et al., 2022). Furthermore, when creating 3D representations of the Spanish Civil War, it is important to produce detailed images based on historical sources, including attributes such as helmets, uniforms, weapons, and other realistic elements.

The implementation of the metaverse in learning about Greek history allows students to digitally experience historical events. Through social virtual reality and interactive e-books, students are encouraged to communicate actively, while also enhancing their confidence and empathy (Papadopoulou et al., 2024). The use of interactive e-books integrated into the virtual reality environment creates a setting that stimulates student engagement and improves interactivity.

Historical content presented through the metaverse provides an in-depth and meaningful learning experience. Historical narratives delivered via virtual reality (VR) can help students explore digital landscapes, providing transformative and effective experiences while connecting their understanding of the past with their present knowledge. Teachers, as educators, must take an active role in integrating virtual reality into the classroom, carefully designing VR as an effective learning medium to enhance history education (Christopoulos et al., 2024).

In Russia, modern, online history education has a significant impact on students' competencies and skills, including technical competence with modern technology, creativity, critical and strategic thinking, and practical skills (Malysheva et al., 2022). The implementation of digital tools and technologies, combined with changes in modern teaching methods at higher education institutions, significantly enhances the quality of history education.

In addition to metaverse products, the metaverse can also be implemented through various platforms. The use of the metaverse for history learning via Gather.Town is more engaging than Webex (Park & Sohn, 2023)—thanks to the avatar feature in Gather. The town is interesting for students, allowing them to select avatars that reflect their sense of participation in their characters. Students can attend classes and interact while controlling their avatars, which provides more active engagement. In contrast, on Webex, students remain passive, only listening to lectures and viewing PowerPoint presentations.

It is important to implement Gather.Town in history education because it provides many visual features (Park & Sohn, 2023). Digital resources can be used to support students in conducting investigations, allowing them to gain multiple perspectives on history. In learning environments that implement the metaverse, it becomes easier to enhance interactions among students, teachers, and lecturers (Papadopoulou et al., 2024; Park & Sohn, 2023).

Art history learning in Korea is considered suitable for the implementation of digital resources. By linking original images with defined images from digital resources associated with objects, students can appreciate them from multiple perspectives. Metaverse classes can be designed virtually by presenting museums, objects, and digital resources. Students show greater interest in learning art history using Gather.Town compared to Webex—the Gather.Town metaverse, combined with e-books and virtual reality featuring many virtual elements, can help students actively participate in class (Papadopoulou et al., 2024; Park & Sohn, 2023).

Institutional, Teacher, and Student Readiness

All parties involved in teaching and learning should be ready and make efforts to develop and implement the metaverse in history education. Institutions must be prepared with the necessary facilities and infrastructure to implement history learning integrated with the metaverse. Moreover, institutions must ensure the compatibility of internet access and technological devices. A lack of internet access or insufficient devices for students can disturb the learning process (Yildirim & Keçeci, 2024).

Teachers, as educators, should be innovative and creative in developing a range of methods, media, and resources for history education (Prastowo, 2019; Widja, 1989). One of the methods is implementing the metaverse. The creativity of both teachers and students is important in designing this specialized method and making effective use of relevant learning resources (Widja, 2018). History teachers must be able to use technology in their teaching. Students tend to prefer history teachers who can employ a variety of teaching methods in online learning. Additionally, teachers should have strong communication skills to teach history effectively, improving a more positive learning environment for students (Jamiludin & Darnawati, 2022).

Teachers, as lesson planners, should also carefully adjust the use of VR to fulfill the students' interests and needs. Furthermore, it is necessary to develop pedagogical strategies through gamification to minimize students' cognitive load while providing a learning orientation aligned with the use of the metaverse. This approach helps students feel comfortable and engaged in history learning (Christopoulos et al., 2024).

Effective metaverse-integrated history learning requires students to have access to adequate learning resources. This includes history textbooks, compatible smartphones, laptops, and a stable internet connection to fully engage in metaverse-based activities (Kim et al., 2025; Jamiludin & Darnawati, 2022; Papadopoulou et al., 2024; Park & Sohn, 2023). In addition to physical resources, students need to be emotionally prepared for learning in the metaverse. High expectations and positive perceptions can further enhance their engagement and experience in history learning through VR (Christopoulos et al., 2024).

Historical Content Themes for the Metaverse

History education is a discipline that requires specialized teaching approaches and a professionally designed teaching and learning process (Steele, 1976). Moreover, this learning process is expected to foster improvements in students' attitudes and character development. Lickona (1992) identifies three essential aspects of character development: knowledge of what is good, the practice of good behavior, and internal motivation to do good. Historical explanations can serve as a benchmark for an individual's attitudes and behaviors; therefore, they must present a comprehensive historical narrative to support the formation of a strong national character and enhance students' historical awareness (Hasan, 1999; Kartodirdjo, 1987; Zuhdi, 2010). Students should be taught historical facts, interpretation, analysis, reconstruction,

archival records, as well as critical thinking skills to identify bias, understand cause and effect, and recognize continuity and change.

The historical content developed for history learning using metaverse technology is diverse. Local historical materials, particularly those related to cultural heritage, can be developed, such as the history of heritage from the Roman era (Corrales et al., 2024). The use of local historical content presents a significant potential for enhancement. However, teachers may encounter challenges in locating reliable sources on local heritage (Corrales et al., 2024). Historical content on warfare can be developed through 3D virtual iconography, such as the Spanish Civil War. In addition, art history and its methodology have been developed in Korea (Park & Sohn, 2023). The maturation of national integration shapes a nation's identity. History is not only about the past; it also reflects the future and provides valuable lessons for students today. The nation of Indonesia is the product of nationalist struggles in building a country capable of meeting the challenges of modernization. Therefore, in practice, history learning in Indonesia can enhance historical awareness when presented innovatively with themes from Indonesian history (Sariyatun et al., 2025). Various topics that can be further developed include public history, the cultural history of the archipelago, local history of Kalimantan, ancient Indonesian history, prehistoric periods, and historical museums (Aubert et al., 2018; Lombard et al., 1996; Nafi'ah et al., 2023; 2023; Sariyatun et al., 2024).

Prospects and Impacts of the Metaverse in History Education

The use of the metaverse in history education holds great potential for development in Indonesia, making the teaching and learning process more effective. The government is expected to provide supporting facilities and infrastructure across Indonesia so that the metaverse can be used effectively, achieving equitable history-learning outcomes for students. Students' interest and motivation to learn history through virtual tours will also increase (Corrales et al., 2024).

The impacts of the metaverse on history education are positive: it fosters students' motivation and interest, improves students' learning outcomes, develops students' ICT skills to support history learning, enhances social integration in the learning environment through collaboration and active participation, and strengthens the innovation capacity of both teachers and students (Christopoulos et al., 2024; Corrales et al., 2024).

In Russia, digital history materials have a positive effect on students' creative thinking (Malysheva et al., 2022). This indicates that, in the future, history education has a promising prospect for developing digital history learning programs at various universities around the world.

The implementation of virtual reality helps create meaningful history learning. Moreover, it can enhance virtual reality-assisted teaching in the history learning environment, facilitate the accumulation of software resources in instruction, and support the inheritance and transformation of the relationship between teachers and students in the virtual environment (Na'im et al., 2026; Zhang et al., 2023).

The implementation of virtual reality in cultural history learning improves students' academic performance, motivation, cultural sensitivity, and positive attitudes toward history learning. In addition, this implementation influences knowledge understanding (Sabbah et al). There is a significant improvement because a rich virtual environment can provide students with a more holistic learning experience, thereby enhancing their learning outcomes (Christopoulos et al., 2024; Shandu-Phetla, 2025).

In addition to the positive impacts, the use of the metaverse unfortunately brings negative impacts. In some cases, there is a negative correlation between overly high expectations and learning effectiveness. Therefore, carefully integrating virtual reality in history teaching is a must. The long-term effects remain to be demonstrated through further research (Christopoulos et al., 2024).

Furthermore, the development of the metaverse shows promising prospects for enhancing the quality of history education in the future, including: 1) comparative studies on the presentation of historical content and controversial history; 2) psychological assessments of students' empathy; and 3) the integration of artificial intelligence with immersive historical narratives (Papadopoulou et al., 2024). Consequently, the use of the metaverse in history learning represents a potential area for future research. However, a challenge remains, as improper implementation of the metaverse may reduce students' motivation or their perception of learning effectiveness. This also highlights an important factor for further research in history education.

CONCLUSION

The advancement of digital technology has significantly influenced educational practices, including history education. This systematic review shows that the metaverse has the potential to support history learning by creating interactive, immersive, and contextual learning environments. Through virtual historical spaces, immersive simulations, digital heritage environments, virtual museums, augmented reality, and interactive platforms, the metaverse can help students experience history beyond conventional text-based and memorization-oriented learning.

The findings indicate that the development of the metaverse in history education can be directed toward several key areas: designing appropriate virtual historical environments, selecting relevant historical content, developing suitable metaverse products and platforms, strengthening institutional readiness, and improving teacher and student preparedness. Metaverse-based history learning can support students' engagement, motivation, historical understanding, and historical thinking skills when guided by a clear pedagogical design. Therefore, the metaverse should not be viewed merely as a technological tool, but as a learning environment that can encourage inquiry, interpretation, contextualization, historical empathy, and critical reflection.

The implementation of the metaverse in history education requires careful planning. Teachers need to select historical topics and learning materials that are appropriate to students' characteristics, curriculum objectives, and the goals of history education. Instructional designers also need to ensure that metaverse platforms are accessible, user-friendly, and aligned with learning outcomes. At the institutional level, schools and universities need to provide adequate infrastructure, including stable internet access, compatible devices such as laptops and smartphones, and Virtual Reality (VR) facilities. Policy support is also needed to ensure that metaverse-based history learning can be implemented effectively and equitably across different educational contexts.

This study has several limitations. The review was limited to English-language journal articles indexed in Scopus and ScienceDirect and published between 2019 and 2024. Therefore, relevant studies from other languages, databases, conference proceedings, books, or non-indexed journals may have been excluded. In addition, only 10 articles were selected for in-depth analysis, which limits the generalizability of the findings. The selected studies also varied in terms of research design, participants, learning contexts, metaverse platforms, and outcome variables. As a result, this review did not conduct a statistical meta-analysis or calculate pooled effect sizes. The findings should therefore be interpreted as an exploratory thematic synthesis rather than conclusive evidence of the effectiveness of the metaverse in history education.

Future research should examine the integration of the metaverse into history education more deeply, particularly regarding the design of historical materials, learning models, platform selection, assessment methods, and long-term learning outcomes. Further empirical studies are also needed to investigate the impact of metaverse-based history learning on specific variables, such as learning achievement, motivation, engagement, attitudes toward history learning, historical understanding, historical empathy, and historical thinking skills. In this way, future research can provide stronger evidence of the metaverse's role in transforming history education from rote memorization to meaningful, inquiry-based, and reflective learning.

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APPENDIX

Table 3.

Results of Literature Database Search

Database	Keywords	Documents
Scopus	(("metaverse education" OR " metaverse in history education" OR " metaverses education" OR "metaverse pedagogy" OR "metaverse andragogy" OR "metaverse teaching" OR "metaverse schooling" OR "metaverse learning" OR "superverse" OR " metaverses " OR " mix reality " OR " digital word " OR " extended reality " OR " augmented reality " OR " 3D " OR " Virtual reality " OR " Virtual learning " OR "online learning " AND " history teaching " OR " history learning " OR " historical instruction " OR " history education " AND " social studies " OR " social science " OR " humanities " OR " virtual learning " OR " strategy " OR " design " OR " approach " OR " planning " OR " model " OR " strategy development " AND " college " OR " educational " OR " institution " OR " university " OR " institute " OR " academy " OR " senior high school " OR " secondary school " OR " middle school " OR " intermediate school " OR " junior high school " *)) .	48 documents
ScienceDirect	TITLE-ABS-KEY (("metaverse education in history" OR "metaverses education in history" OR "metaverse pedagogy in history" " OR "metaverse andragogy in history" OR "metaverse teaching" OR "metaverse schooling" OR "metaverse learning")).	71 documents

Table 4.*Selected Articles for the Review*

Paper ID	Author(s)	Publication Year	Journal Name	Publisher	Indexing
A1	Zhang X. & Wang X.; Lu J.	2023	International Journal of Web-Based Learning and Teaching Technologies	IGI Global	Scopus
A2	Jamiludin J. & Darnawati D.	2022	International Journal of Evaluation and Research in Education	Institute of Advanced Engineering and Science	Scopus
A3	Papadopoulou A et al	2024	Information (Switzerland)	Multidisciplinary Digital Publishing Institute (MDPI)	Scopus
A4	Malysheva O et al	2022	Heliyon	Elsevier Ltd	Scopus
A5	Corrales M et al	2024	Heritage	Multidisciplinary Digital Publishing Institute (MDPI)	Scopus
A6	Yildirim P & Kececi G.	2024	Journal of Computer Assisted Learning	John Wiley and Sons Inc	Scopus
A7	Park J & Sohn S.	2023	Harmonia: Journal of Arts Research and Education	Universitas Negeri Semarang	Scopus
A8	Christopoulos A et al	2024	Information (Switzerland)	Multidisciplinary Digital Publishing Institute (MDPI)	Scopus
A9	Sospedra-Roca R et al	2022	Cogent Education	Taylor and Francis Ltd.	Scopus
A10	Dwivedi, Yogesh K. et al	2022	International Journal of Information Management	Elsevier Ltd	Scopus

Diagram 2.

The metaverse strategy model in history education

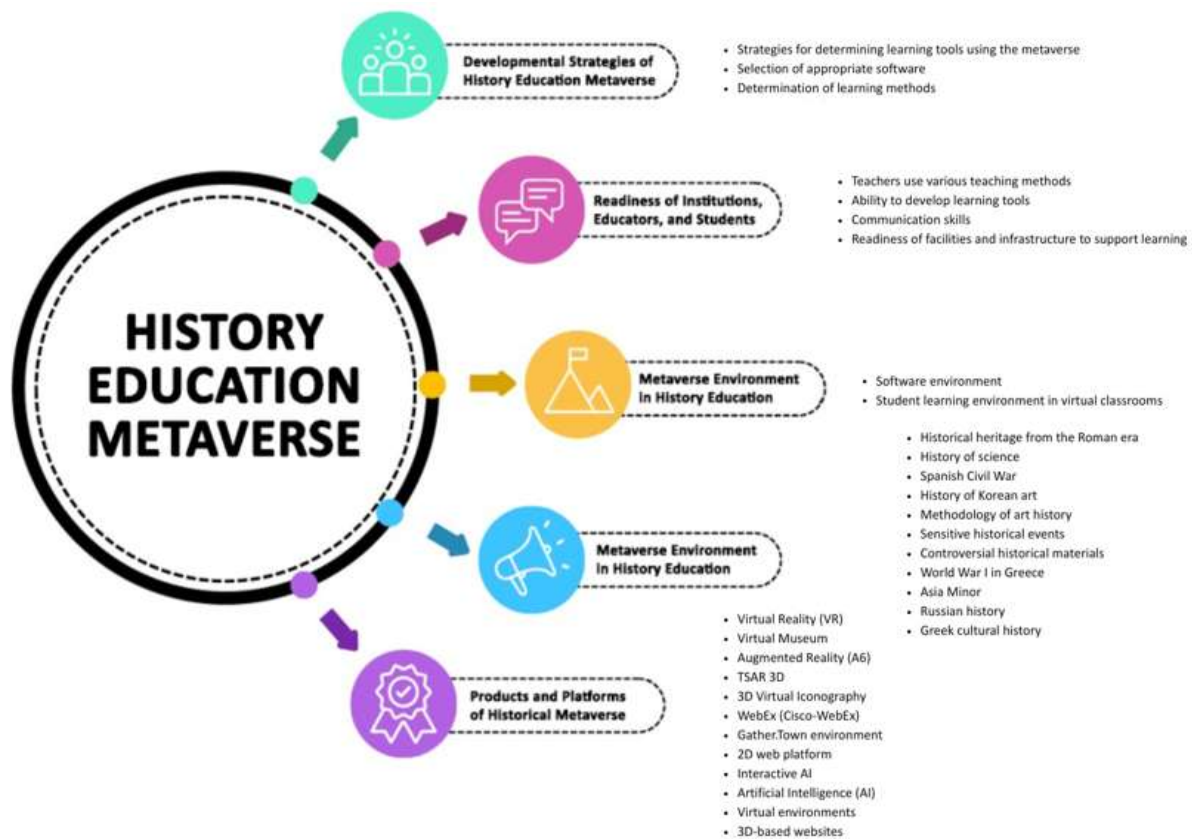


Table 7.
Distribution of Themes to Be Analyzed

Theme Topic	Number of Documents	Main Research Design	Author(s)
Strategies for the Development and Utilization of Historical Metaverse	2	QL; 2	Dwivedi, Yogesh K. et al (2022); Zhang X. & Wang X.; Lu J. (2023)
Metaverse Environment in History Education	2	MM: 1 DM: 1	Corrales M et al (2024); Yildirim P & Kececi G. (2024)
Products and Platforms of Historical Metaverse	3	QN: 3	Sospedra-Roca R et al (2022); Papadopoulou A et al (2024); Christopoulos A et al (2024)
Readiness of Institutions, Educators, and Students	1	MM:1	Jamiludin J. & Darnawati D. (2022)
Historical Content Topics for the Metaverse	2	QL: 1 QN; 1	Park J & Sohn S (2023); Malysheva O et al (2022)