



## **Immersive Reconstruction of the Sriwijaya Kingdom: Developing a Metaverse-Based Learning Environment for Cultural Preservation**

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**Abstract:** This research's purpose is to create and subsequently confirm the efficacy of a virtual world-based learning experience representing a bygone civilization, specifically the Srivijaya Empire, as part of a project to digitally preserve and teach about historic events. The research used research and development techniques based on the 4-D model which includes a definition, design, development, and validation phase. The final products being developed include virtual reality (VR), augmented reality (AR) and other forms of virtual representations such as 3D models, and will also include an immersive video format with 360° views which can be viewed via YouTube in order to make them more widely available as well as accessible to more people. The needs analysis showed there were problems with the way history has been traditionally taught, especially when trying to provide local historical heritage in terms of what happened and how it happened within the context of that particular location. The design phase focused on creating a narrative reconstruction that depicts the maritime trading network and socio/cultural/religious life that existed during the time of the Srivijaya Kingdom, based on both historiography and archaeological evidence. During the development phase, there was a validation process for the two media specialists and the two content specialists who validated the content by completing a limited practicality test with sixty students. Validation results were very positive in each tested area: visual design, navigation systems; use of technology, and historical accuracy (scores averaged above 4.5 on a 5-level Likert scale). Students perceived the research materials as highly practical, especially regarding usability and their ability to increase their historical contextual knowledge. At present this research represents an initial phase limited to validation and practicality testing, and thus has not provided an assessment of learning effectiveness through experimental comparison. This research creates a prototype for immersive digital heritage learning, utilizing historical reconstruction based on metaverse principles and combining these elements and theories for instructional design. Therefore, the results will create a framework that can serve as a basis for further development toward supporting the preservation of digital cultural heritage through educational systems.

**Keywords:** cultural preservation; historical education; metaverse; Sriwijaya Kingdom; virtual reality

**Abstrak:** Tujuan penelitian ini adalah untuk menciptakan dan kemudian mengonfirmasi efektivitas pengalaman belajar berbasis dunia virtual yang merepresentasikan peradaban masa lalu, khususnya Kekaisaran Srivijaya, sebagai bagian dari proyek pelestarian dan pengajaran digital tentang peristiwa sejarah. Penelitian ini menggunakan teknik penelitian dan pengembangan berdasarkan model 4-D yang mencakup fase definisi, desain, pengembangan, dan validasi. Produk akhir yang dikembangkan meliputi realitas virtual (VR), realitas tertambah (AR), dan bentuk representasi virtual lainnya seperti model 3D, dan juga akan mencakup format video imersif dengan tampilan 360° yang dapat dilihat melalui YouTube agar lebih mudah diakses oleh lebih banyak orang. Analisis kebutuhan menunjukkan adanya masalah dengan cara sejarah diajarkan secara tradisional, terutama ketika mencoba memberikan warisan sejarah

lokal dalam hal apa yang terjadi dan bagaimana hal itu terjadi dalam konteks lokasi tertentu. Fase desain berfokus pada pembuatan rekonstruksi naratif yang menggambarkan jaringan perdagangan maritim dan kehidupan sosial/budaya/agama yang ada pada masa Kerajaan Sriwijaya, berdasarkan historiografi dan bukti arkeologis. Selama fase pengembangan, terdapat proses validasi untuk dua spesialis media dan dua spesialis konten yang memvalidasi konten dengan menyelesaikan uji kepraktisan terbatas dengan enam puluh siswa. Hasil validasi sangat positif di setiap area yang diuji: desain visual, sistem navigasi; penggunaan teknologi, dan akurasi historis (skor rata-rata di atas 4,5 pada skala Likert 5 tingkat). Siswa menganggap materi penelitian sangat praktis, terutama mengenai kegunaan dan kemampuan mereka untuk meningkatkan pengetahuan kontekstual historis mereka. Saat ini penelitian ini mewakili fase awal yang terbatas pada validasi dan pengujian kepraktisan, dan karenanya belum memberikan penilaian efektivitas pembelajaran melalui perbandingan eksperimental. Penelitian ini menciptakan prototipe untuk pembelajaran warisan digital imersif, memanfaatkan rekonstruksi sejarah berdasarkan prinsip metaverse dan menggabungkan elemen dan teori ini untuk desain instruksional. Oleh karena itu, hasilnya akan menciptakan kerangka kerja yang dapat berfungsi sebagai dasar untuk pengembangan lebih lanjut menuju dukungan pelestarian warisan budaya digital melalui sistem pendidikan.

**Kata Kunci:** Kerajaan Sriwijaya; metaverse; pelestarian budaya; pendidikan sejarah; realitas virtual



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## Introduction

The metaverse came up as a transformative phenomenon that brings together all patches of human interactions, transactions, and cultures within one digital space. This research is therefore an attempt at developing the Sriwijaya Kingdom Metaverse covering the trade, economy, social and cultural aspects as steps in digitizing the history of Indonesia. The Kingdom of Sriwijaya was among the strongest maritime empires in Southeast Asia thus highly probable to be used as a prototype in running metaverse as means through which heritage will be conserved and also promoted. Virtual Reality (VR) and Augmented Reality (AR) technologies incorporated into metaverses would further enhance user engagement with educational, historical, and cultural technologies to an extent that such activities would bring much understanding to Indonesian historical narratives.

The innovations of the metaverse would allow for interactive environments capable of simulating historical contexts and cultural practices. For instance, users may participate in reconstructed sites of intangible heritage, cultural activities, or trade simulations representing the economic life of the Sriwijaya era (Park & Kim, 2022; Jauhiainen et al., 2022) in order to have a fully immersive experience that will bring about historical knowledge preservation but also enhance social interactions and collective memory building (Allam et al., 2022; Jauhiainen et al., 2022). There is a global trend towards using interactive learning as a way to renew and pass down traditional knowledge and culture; see (Tural 2023) and (Damasevicius et al 2024). Unfortunately, however, putting these ideas into practice is often difficult, mainly due to several different barriers. For example, an adequate supply of digital technology is still hard to come by for many people in the community, and as such, they may not have access to this type of resource. Additionally, there is a need for a library of accurately represented authentic items

that are historical in nature and can serve as digital representations of cultural heritage. (Othman, 2024; Al-Kfairy et al., 2024). Also, the sustainability of metaverse platforms needs the right tech setup for smooth dealings (Park & Kim, 2022; Jauhiainen et al., 2022). Thus, it is key to plan a system that looks at user experience, data safety, and respect for culture (Fiaz et al., 2024).

The development of the Sriwijaya Kingdom Metaverse is not only relevant from a technological perspective but also from a cultural and historical perspective. Leveraging the immersive aspects of the metaverse, this research tries to practically contribute towards preserving Indonesian cultural heritage in the 21st century digital era (Park & Kim, 2022; Jauhiainen et al., 2022). The strength of this research lies in unveiling how technologies like VR, AR, and blockchain can be applied to preserve and promote culture, especially that related to the history of the Sriwijaya Kingdom. For massive public involvement, the method should ensure both digital access and cultural inclusion within cyberspaces. Thus, an authentic sustainable user-centered technological infrastructure is required for a metaverse platform to succeed.

The proposed solution presents the combination of Virtual Reality and Augmented Reality as applications that immerse users in historical places and simulations of cultural phenomena. On the other hand, blockchain technology will be used to secure and validate digital cultural assets. The metaverse platforms also have to be available for everyone, e.g., through an HTML5-based system with content in various languages and different formats. The metaverse is defined here as an immersive, long-lasting virtual world; merging VR, AR, and the web allows human beings, computers, and digital artifacts to interact in real time (Wang et al., 2023; Yang et al., 2022). The merging of physical and digital worlds that creates a new environment where social, economic, and cultural activities take place simultaneously (Buhalis et al., 2022; Huynh-The et al., 2023).

The major characteristics of the metaverse are interoperability, user-generated content, and a decentralized economy which blockchain powers. As described by Gadekallu et al., 2022, interoperability within the framework preserves digital identities across interacting platforms. Content created by users fosters cooperation and builds digital community formations (Buragohain, 2024). Transactions are safe, and ownership rights are secure when using blockchain. As a result, the metaverse provides numerous opportunities for applications in education, tourism, and cultural preservation. One way that education utilizes this technology is to create an experiential learning environment (Al-Ghaili et al., 2022; Kouroupi, 2023), while virtual tourism allows users to explore many different places without having to be at those locations (To, 2023; Innocente, 2024). Cultural preservation is accomplished by reconstructing and representing aspects of cultural heritage within a digital environment through the use of this technology.

A number of earlier research have examined the metaverse from perspectives related to its technology, architecture and sustainability of its operations (Park et al., 2022; Wang et al., 2023; Yang et al., 2022). However, most of these previously published literature remained in a conceptual form focused on taxonomy, interoperability and secure blockchain integration; thus providing little if any empirical evidence on the utilization of metaverses in education through whichever kind of learning, be it through Immersive Learning Experiences (ILEs), to Virtual Tourism (Al-Ghaili et al., 2022; Kouroupi, 2023; To, 2023). On the other hand, research regarding digital Cultural Heritage (CH) has generally been concerned with technical reconstructions or virtual exhibitions without a systematic integration of an appropriate instructional design model into the execution of formal history teaching (Jauhiainen et al., 2022; Innocente, 2024; Buragohain, 2024). There has not yet been a significant amount of empirical

development research that combines ILEs and/or structured design learning (SDL) with the digital reconstruction of local civilization and history in an Indonesian context.

The pedagogical context of teaching history makes this situation even more serious. In many cases, the means by which we teach history are based on written narratives and two-dimensional images, limiting the amount of contextual experience and learning that students would have had they been able to interact with history through immersive learning environments. Several studies have shown that when we provide immersively experienced, interactive learning environments for learning history, each type of engagement (emotional and cognitive) is enhanced (Damaševičius, 2024; Damasevicius & Sidekerskiene, 2024). Nonetheless, at present, we have not been able to optimally utilize immersive learning environment technologies in supporting the reconstruction of local history. In addition, findings from several metaverse initiatives (Othman, 2024) have identified accessibility and inclusivity issues. Many projects focus on having technologically advanced solutions without addressing how they can be realistically used in a classroom setting and provide all users with equal access.

This research is intended to validate and develop a new learning environment based on the rebuilt Srivijaya Kingdom in a metaverse formatted by the 4D Learning Development Model (Thiagarajan et al., 1974). The process used to create this development uses three-dimensional modelling, augmented reality, virtual reality, to create a fully immersive 360-degree experience that can easily be accessed using digital technology. Due to its pedagogical focus, not only technical development, the metaverse, as a digital heritage site will provide a structured environment for history curriculum-based learning goals. This research's contribution is the use of a blended 4-D Instructional Design framework with an immersive metaverse reconstruction of digital heritage learning. The reconstructed metaverse will focus on the maritime trade networks, sociocultural structures, and religious life of the historical Srivijaya Kingdom from historical and archaeological sources.

The implementation model emphasizes access to the reconstructed metaverse and digital heritage learning through widespread digital technology platforms rather than dedicated virtual reality (VR) hardware devices. In addition, this implementation model seeks to provide a resolution to the challenges associated with digital inclusion and sustainability in the design and development of educational technology (Othman, 2024; Allam et al., 2022). This research will only cover development, expert validation, and testing for feasibility. It will not look at how effective or effective the teaching methods are compared to other methods or how long they can be used in a classroom environment. Thus, results from this research will only assist with validation of a pedagogically appropriate immersive digital cultural heritage learning prototype but not be used to determine if it is an effective way to improve student learning.

## Research Methods

The research method for this project is research and development. The four D's of learning development used in this project are the 4D learning development model of Thiagarajan et al. (1974): Define, Design, Develop, and Disseminate. The research was limited to the Define, Design, and Develop phases. During the Develop phase, validation and practicability testing were performed. The next phase (Disseminate) is intended for future research.

The purpose of the Define Phase is to identify educational needs and problems in teaching and learning about history. The historical period of focus is on how the students learn about the Srivijaya Kingdom during the learning process. The data has been obtained through classroom observations of history lecturers and semi-structured interviews with history undergraduate students. The analysis of the findings includes identifying the limitations of traditional methods of learning and media, student characteristics, and the developed expectation of a

comprehensive digital learning environment. The outcomes of this stage include outlining educational needs and defining the thematic focus areas of the thematic reconstruction of the Srivijaya Kingdom, including, the maritime trade network, socio-cultural system, and religion or culture.

In the Design stage, two outputs were generated using the 4D model as a base. They are a development of a learning framework and the virtual reconstruction created according to the 4D model's systematic approach. The narrative script, as well as virtual mapping and character modelling, were developed based upon the designated learning objectives provided and the sequence of material. The immersive environment was designed based on the concept of a metaverse, which is defined by providing interactivity and the use of digital tools in an engaging and sustainable virtual learning environment that supports feelings of presence and digital interaction (Ng, 2022), and for virtual reconstructions of historical landscapes and elements of their socio-cultural context, based on the principles of digital heritage modelling providing for authentic and contextually-representative and accurately-interpreted reconstructions in the virtual environment (Zhang et al., 2022). The integration of virtual reality, augmented reality technology, and 3D modeling in an immersive video format [accessible via common digital platforms] makes for an immersive learning experience that is aligned with instructional objectives.

A working model was generated in the prototyping stage of development, followed by expert validation and limited user testing. The participant group involved two media professionals with qualifications in educational technology and digital media design and two content professionals specialised in Indonesian history. The testers for this project, sixty undergraduate students researching subjects relating to history, were selected to participate within the context of their research area using purposive sampling techniques to ensure relevance to both the subject matter and their prior experience with digital learning environments.

Structured data collection used a validation and practicality questionnaire with a 5-point Likert scale (1 = very inappropriate and 5 = very appropriate). Media validation assessed visual design quality, navigational interface, integrated use of technology, and ease of use. Material validation assessed historical accuracy, relevance to instructional goals/content, narrative coherence, and appropriateness for instructional needs. Practicality assessed as ease of use, visual attractiveness, clarity of information presented, and perceived usefulness in enhancing contextual understanding of the historical materials being studied.

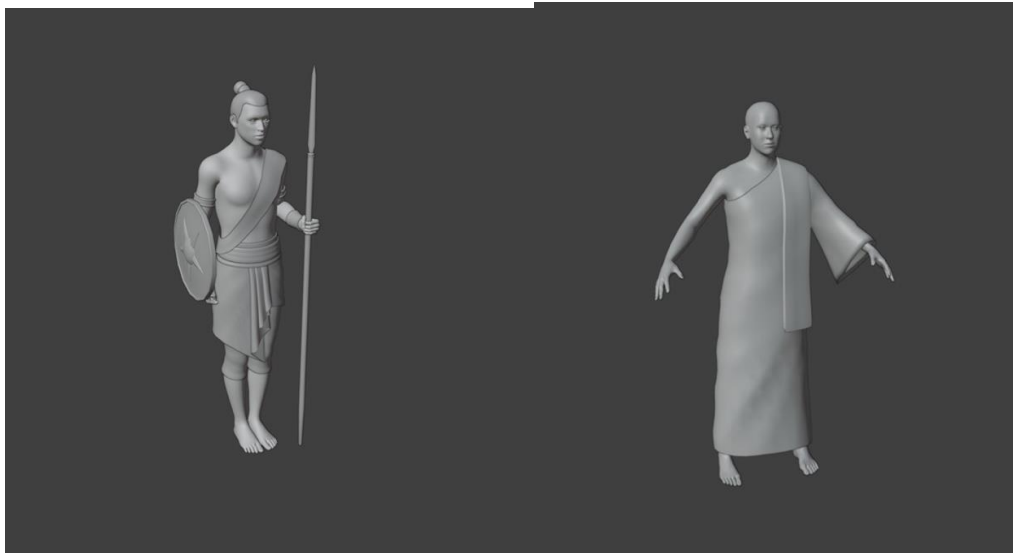
Descriptive stats were used to determine mean (average) scores per dimension and indicator, to find an overall component mean score. The feasibility interpretation scheme consisted of multiple score categories and ranges: very valid/practical (4.21 and above), valid/practical (3.41 to 4.20), moderately valid (2.61 to 3.40), less valid (1.81 to 2.60), and invalid (1.00 to 1.80). Overall product feasibility was assessed by deriving an aggregate mean score from the average scores of all assessment indicators. This research did not utilize an experimental design, include testing or sampling measures pre- and post-intervention, nor was there any large-scale dissemination. As such, this research's findings are only descriptive in nature; these findings provide an evaluation of how well the 4D Model Framework (Thiagarajan et al., 1974) worked as a framework for evaluating the establishment phase of this project. Future research assessing the effectiveness of the educational methods used in this project will help assess their effectiveness for the pure educational purpose and developmental purposes to help understand how they can be integrated into the classroom setting.

## **Research Result**

### **Result**

The Define phase carries out a needs assessment and sets major goals for the development of the Sriwijaya Kedatuan Metaverse. In this phase, it highlighted how history learning could be viewed as very traditional and not attractive to the digital generation. Results from a preliminary observation and interviews with lecturers and students justified that interactive and immersive learning media are essential components that would raise interest in learning and understanding more deeply about the local historical context. From these analyses, metaverse-based media is what can reconstruct virtually the social, economic, and cultural lives of the Sriwijaya Kedatuan era in transmitting culture as well as innovating history learning in the 21st century. The Design stage became very important because it is at this stage that the gap between the identified needs and the concrete form of the resultant digital product is bridged. After an exhaustive analysis of needs, researchers found out that the greatest challenge in representing history at Sriwijaya Kedatuan lay in how to present historical content visually, not only with scientific accuracy but also attractively and vividly. Therefore, at this design phase, researchers conceptualized developing a virtual reality-based metaverse through YouTube which would be implemented by focusing on three major aspects: narrative design, environmental design (landscape), and character design.

The prototype was implemented in a 360 degree immersive video format distributed through an open access digital platform. This deployment model was selected to ensure technological accessibility, device compatibility, and scalability within formal educational contexts without requiring specialized immersive hardware. Thus, this method underlines not just the technological side but also puts at the forefront the notions of inclusivity and availability two crucial bases in making contemporary technology-based educational media. In terms of narrative design, three main strands were developed by the research team as the basis of experience design within this metaverse platform: (1) a storyline about maritime trade, (2) the dynamics of social and cultural life, and (3) spirituality and religious life in the time of Srivijaya Empire. The three strands were then further elaborated into a cinematic scenario with a story structure consisting of compelling beginning, middle, and end that can arouse curiosity plus implant historical values in users. Every scenario here is based on scientific studies and interviews with historians besides critically interpreting relevant historical artifacts and documents. A good story will not work without great visuals to back it up. So, in this design phase, the researchers also created digital designs of landscapes for several key spots that were hubs of action during the Sriwijaya Empire. For example, the main port in the Musi River area is visually rebuilt by looking at architectural details of docks, the shape of trading ships, and warehouses where spices and other goods were kept. As a result, the main port in the Musi River region was reconstructed visually considering the architectural details of the docks, the form of the trade vessels, and the warehouses used to store spices and other trade goods, through a collaborative and interdisciplinary approach involving research into both archaeology and historiography to complete the landscape reconstruction while ensuring that the reconstructed virtual environment maintains spatial authenticity and increases the epistemic quality.



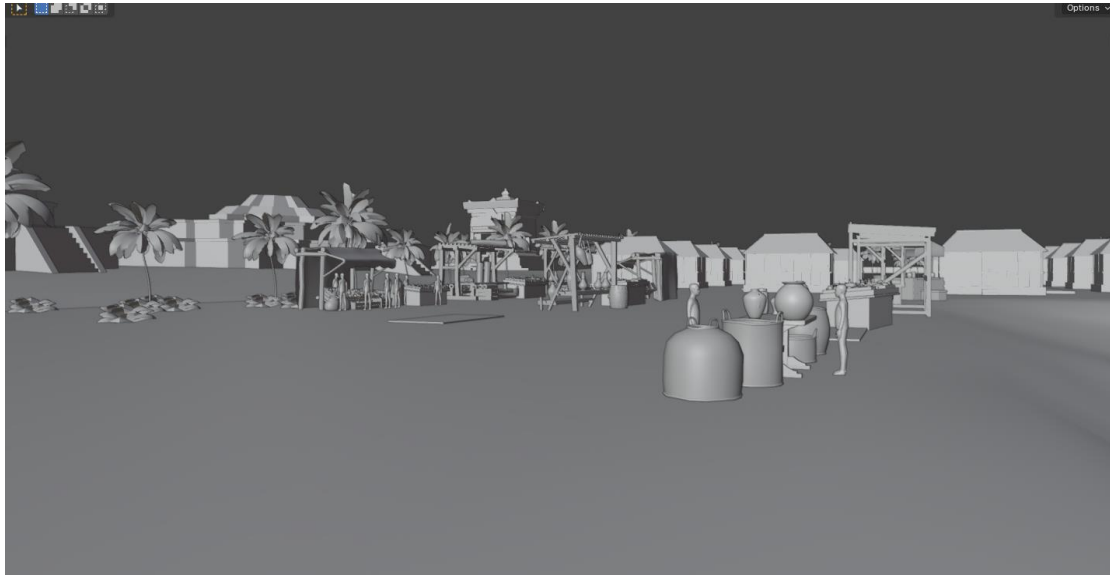
**Figure 1.** Character Design Draft  
Source: Research Data, 2025

The character design aspect of the project provides an exciting addition to the activities of the Srivijaya Kingdom Metaverse. As part of this effort, researchers created several different main characters that reflect different classes of society during the Srivijaya period (ca. 500-1010 AD) in order to help users learn about how the dynamic interplay of the social and cultural spheres in the kingdom occurred. The three classes that have been developed for the purposes of this project were those of local and foreign merchants, monks of the Buddhist faith, and the general populace, evidencing daily life in and around the established borders of the Srivijaya Kingdom.

Character reconstruction represented the multicultural maritime interactions that historically characterized the Srivijaya trade network. The modeling of traders was grounded in historiographical documentation and archaeological interpretation to ensure contextual credibility within the reconstructed digital environment. The visual attributes assigned to each character were systematically aligned with documented cultural references and historical iconography. This alignment was intended to maintain representational accuracy while supporting immersive narrative coherence within the virtual reconstruction. These characters follow references dating back to the relics of Borobudur Temple, the travelogues of I-Tsing, and conversations with specialists on Southeast Asian maritime history for them to ensure that their representation stays within accuracy toward history. The local traders from Srivijaya have been conceptualized in the ancient Malay dress by various visual references and some literature on archaeology. This design phase shows that the metaverse is not a techno-centric endeavor, but rather an amalgamation of narrative, history, and visual art. In this approach, the researchers try to "resurrect" history in novel ways that would make it pertinent to contemporary digital times. All these processes are based on one solid conviction: while history is indeed meant to be preserved, it equally needs strong celebration and retelling and handing down using media appropriate for the time. The development phase then becomes the concrete phase of the entire process of developing this digital educational media, mixing and blending ingredients of history, technology, and local culture.

For this research project, the Development Phase includes creating visual historical content for the Srivijaya People based on their real-life experience through invention and

imagination with factual knowledge about their social economic development (social economic basis) and spiritual development. The main goal of this phase is to create a tangible project's concept into digital learning media to enable students' historical literacy and cultural sensitivity within contextual, interactive, and meaningful learning environments. The digitalization and animation of a design are the second steps of developing our designs into full visual products. The first phase of development involved conceptual design and this was the design we had developed into the digital phase that would become a visual learning environment that can be used as an actual resource during the history learning process.



**Figure 2.** Landscape Design Draft

Source: Research Data, 2025

The prototype was developed using 3D modeling and digital animation tools to construct spatial depth, environmental texture, and visual layering. These technical refinements supported immersive representation while maintaining alignment with instructional objectives. There is also parallax effects in some sections and details that are zoomable which will create interactivity as well as immersion when used inside the Learning Management System (LMS) and even inside educational video formats. The visual product does not only try to hook students on the aesthetic level but also raises their interest in the historical content discussed. Therefore, to further enhance its pedagogical role, all visual elements have been set by learning objectives and main achievement competencies of the Independent Curriculum. No illustration here stands alone but rather is accompanied by educational narratives, provocative questions, and higher-level exploratory options all of which can be integrated into synchronous and asynchronous learning activities. With this kind of approach, students would not remain passive participants in the process of reconstruction of meaning about history. The educational media can reconstruct the Srivijaya civilization by making it relate to and meaningful for the event about building up the identity of this country's young generation through narrative force, visuals, and cultural context.



**Figure 3.** Post-rendered product  
Source: Research Data, 2025

The most important aspect that was very carefully preserved in delivering the product made it not only stick to history but also instilled deep local cultural values was the infusion of local content and community involvement in the development process of the Sriwijaya Kingdom Metaverse. Architectural design, for instance, was adapted from temple remains and monasteries found in South Sumatra which dwell within traditional architectural styles of Malay origin. Among others, stacked roofs, bell carvings, and laterite stone were reconstructed-considering archaeological research-combined with interviews undertaken with local cultural preservationists. So was the case of the merchant and monk characters, for which not only academic documentation but also local Chinese, Arab, and Buddhist communities were involved to share their input on cultural details, clothing, or gestures. This way, what finally comes onto the visuals would be ensured as something very unbiased yet authentic in respect to historical respects-to such a background with cultural diversity that belongs to the Sriwijaya Kingdom.

Once the process of development has been completed, there shall be a limited trial in order to know its feasibility and practicality before going into wider usage. The participants of the trial were 60 students who used it as initial users and two media experts plus two material experts who acted as validators. The trial consisted of validity and practicality. At the validity stage, two groups of experts assessed in parallel. Media expert evaluations of visual appearance, design quality, interface navigation, technology integration, and aesthetics consistency in the metaverse environment provided assurance that all media developed was functional and technically stable enough to deliver an engaging learning experience. At the same time, material experts used the following criteria to determine whether or not the content met criteria for its appropriateness to the historical content: 1) historical content, 2) accuracy of archaeological data, 3) alignment of the narrative to scientific sources, and 4) the ability of the material to meet the objectives for teaching the research of history. This validation process confirmed both the

authenticity of the content as representing the Srivijaya Culture and how that content was represented within the metaverse. The practical assessment test involved 60 students, who were asked to rate the ease of access, visual appeal and usability of the media as a means of facilitating the understanding of the historical context of Srivijaya. A Likert scale from 1-5 was used to determine the level of ease of use, visual appeal, clarity of information, and whether the media was useful in assisting with the learning process. A limited number of tests were completed and the data from these tests were compiled in a tabular format, indicating the level of validity and practicality of the product that was developed.

**Table 1.** Results of the Validity and Practicality Test of the Sriwijaya Kedatuan Metaverse Product (n = 60 Students)

Average Score	Test Type (Category)
Validity Test (Media Expert)	4,55 (Valid)
Validity Test (Material Expert)	4,59 ( Valid)
Practical Test (Students)	4,56 ( Practical)

Source: Research Data, 2025

Based on the results of a limited trial, Sriwijaya Kedatuan Metaverse has obtained a very valid level, both from the media and content side. In more detail, visual design, navigation, and technological aspects presented have been assessed as quite appropriate and functional by the media experts. On the other hand, material experts have rated the accuracy highly on the provision of historical substance and narrative as well as relevance to achieve digital history learning objectives. Also, a try-out test by students proved that the media is easy to use, beautiful in appearance, and able to raise historical understanding through an interactive and immersive learning process. The aggregated mean scores exceeding 4.50 across validation and practicality assessments indicate that the product fulfills high feasibility criteria in terms of visual design, historical accuracy, technological integration, and user usability. These findings support the viability of the prototype within limited scale implementation settings. The product can be accessed at the following [link](#).

## Discussion

It is in rapid digital technological development that humans change their ways of learning, getting information, and even understanding history. So far, it has been neglected that this considers the fruits of these technologies found useful for education and preservation concerns in the form of immersive technology Virtual Reality (VR) and Augmented Reality (AR). This research originated from concern over reduced interest among the young generation toward history; particularly local history like Sriwijaya Kedatuan, which until now has depended on textbooks or static visual media at museums for lessons. The metaverse offers a potential huge opening towards bringing history back into a more interactive, participatory format—one that would fit the learning preferences of today's digital generation. At the needs analysis stage, it is imperative to understand what makes up the urgency in developing the Sriwijaya Kedatuan Metaverse platform. Up to this time, there has been a general observation that museums and historical sites do not provide for interactive learning. More specifically, historical artifacts are generally on display but only in glass showcases while historical narratives tend to be monotonous as well as difficult for most people to comprehend. Conversely, new generations

who have grown within digital technologies require dynamic, visual, and experiential methodology; they know simulations, virtual worlds, and digital interactions such that conventional history learning does not seem attractive. Therefore, metaverses development is introduced as an alternative that would effectively bridge the gap between huge potential. Virtual learning environments allow the provision of a much richer emotional and cognitive experience. Learners may be able to "enter" the reconstructed setting virtually, not seeing or reading about but directly experiencing the past. This is where the primary advantage of metaverse lies (Damaševičius, 2024). Tural (2023) also found that an appraisal by pre-service social studies teachers determined that even though most of them had never heard of metaverse technology before, they would like to use it because they think it offers a different and valuable experience in history education. The development of Metaverse-based media does not necessarily have to prioritize visual aspects or immersive effects but rather has to rest on real needs in the field. From observation and interviews, there is a great gap between the very rich historical potential of Srivijaya with its presentation that remains flat and does not engage the emotional aspects of students. Teachers and museum managers also underscore from resources that interactive technology is a constraint toward preserving history about Srivijaya. This kingdom is not only a symbol of past glory but reflects maritime identities in Indonesia and international trade networks at that time.

Findings by Jauhiainen et al. (2022) bring back the thought that when designed with authenticity, historical context, and active participation of users, the metaverse will very successfully connect ancient cultures to contemporary generations. This implies that contents of the metaverse should not be constituted only by 3D graphics or some spectacular visualizations but should include genuine historical narratives based on facts from archaeological and historiographical studies. A needs analysis conducted by the researchers themselves mapped three main themes to dynamics to develop in the metaverse: maritime trade dynamics, social and cultural systems, spirituality, and religious influence during the Srivijaya Empire. In their view, these three themes are most representative in describing the character of the kingdom and its values for contemporary learning.

Allam et al. (2022) also emphasized that the metaverse does not only play a role as a preserving medium but rather simultaneously acts as an intercultural social space allowing value exchange and collaboration between communities. In this sense, the Sriwijaya Kedatuan Metaverse targets not only students as end-users but teachers and students of history, cultural activists, and digital communities; therefore, it has to be developed as a platform in the form of an open, inclusive, collaborative learning space that can formally access a wide audience outside academia. But as Othman (2024) cautioned, many metaverse projects have gone bust because they didn't consider the wide array of user needs. This means that the Sriwijaya Kedatuan Metaverse development should make sure to offer wide digital access reachable on regular gadgets without any particular VR helmets, able to work with limited net links, and showing content in simple-to-understand words. It should also be made to look easy so that using it feels like stepping into a real place and not something tricky.

All this underscores that the Sriwijaya Kedatuan Metaverse is not a techno-project but rather cultural, educational, and national identity work. Thus, a needs analysis becomes very pertinent to validate that what happens in the development of this metaverse is based on real empiricism from the field and not just jumping on an international bandwagon. By getting the educational context, cultural preservation challenges, technological condition, and user needs, this research is expected to yield a history learning medium that would be engaging and meaningful plus sustainable with broad impact. This gap analysis brings out, on the one hand, the enormous potential of Sriwijaya's history and, on the other, its rather archaic presentation-

unadjusted to technological developments and characteristics of modern youth. Thus, to establish a metaverse as a learning medium and also as a vessel of cultural preservation is highly relevant not only in meeting pedagogical needs but also as an effort that would ensure historical awareness besides affirming cultural identity while connecting young generations to their ancestral heritage contextualized in an inspiring and 21st-century manner.

## Conclusion

This research developed Sriwijaya Kedatuan Metaverse as digital learning media, delivering history learning content through immersion by utilizing Virtual Reality (VR) and Augmented Reality (AR) technologies. According to experts' validation, the product is highly appropriate in several aspects. The visual design, navigation ease, and level of technology integration were rated at a high degree by media experts while material experts found the content to be very accurate, relevant from a historical perspective, and suitable for achieving the objectives of digital history learning. Student practicality test results also gained a positive response. Participants rated the media easy to use, good in appearance, and can deliver understanding the history of Sriwijaya Kedatuan better and more contextually. In other words, the function of Sriwijaya Kedatuan Metaverse is not only as an interactive digital medium but also as an effective means that can build interest in learning history and cultural awareness for the young generation. This research proves that the Sriwijaya Kedatuan Metaverse can be a participatory digital technology-based history learning model, achievable to make relevant to the characteristics of 21st-century learners. However, this research is just at the validation and practicality testing stages. There is a need for further research having advanced dissemination and classroom implementation. This step would be very useful in measuring the broad effect both on student learning outcomes and their engagement level toward understanding the value of history and culture in a nation.

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