



3D ANIMATION BASED INTRODUCTION TO THE HISTORY OF PURA CEDOK WARU KUTA

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Abstract

Purpose: This study aims to develop a digital educational medium in the form of a 3D animation to introduce the history, heritage, functions, and cultural values of Pura Dalem Cedok Waru to the public, particularly the younger generation within the Kuta Traditional Village. The limited availability of engaging visual materials related to the temple's history, along with the community's low level of understanding, serves as the main motivation for this research. Through 3D visual storytelling, this work seeks to provide a more informative, communicative, and accessible reconstruction of historical narratives surrounding Pura Cedok Waru.

Research methods: This study employs both primary and secondary data collection methods. Primary data were gathered through field observations, interviews with temple caretakers (pemangku/pengempon), and questionnaires administered to media experts, content experts, and the general public. Secondary data were collected from documentation, historical literature, visual references, and previous studies. The animation production followed three main stages: pre-production, production, and post-production, utilizing Blender 3D as the primary software.

Findings: The research resulted in the creation of a 7-minute and 44-second 3D animated film that visualizes key historical figures such as Prabu Hayam Wuruk, Patih Gajah Mada, Sri Astasura Ratna Bumi Banten, Dalem Ketut Soma Kepakisan, and Ki Arya Telabah and reconstructs the environment associated with Pura Cedok Waru. The animation presents a cohesive narrative that integrates historical events, cultural values, and visual interpretations of the temple's origins, providing an accessible medium for public learning.

Implications: The produced 3D animation serves as an effective cultural documentation medium that can help preserve the historical identity of Pura Cedok Waru. It also demonstrates the potential of digital animation as an educational tool to support cultural literacy among younger audiences. Furthermore, this approach may be applied to other cultural or historical sites to create engaging and informative media for community learning and heritage preservation.

Keywords: 3D animation, Pura Cedok Waru, local history, educational media, Balinese culture.

1. INTRODUCTION

In Balinese culture, pura (temples) represent far more than places of worship; they are living repositories of history, philosophy, and cultural identity that have sustained community values across generations [1]. These sacred spaces serve not only as centers for religious devotion but also as vital hubs for cultural preservation, social cohesion, and educational development, maintaining the continuity of Balinese traditions across generations [2]. Among these significant cultural landmarks stands Pura Dalem



Cedok Waru in Desa Adat Kuta, a temple whose historical narrative is deeply intertwined with Bali's rich past.

The historical significance of Pura Dalem Cedok Waru is particularly profound, tracing its origins to the 14th-century expansion of the Majapahit Kingdom to Bali. The temple's establishment is historically linked to Mahapatih Gajah Mada's expedition, with local accounts documenting his discovery of a sacred spring where he used waru leaves to drink water and subsequently vowed to build a place of worship upon successfully conquering Bali. This compelling historical narrative, however, faces contemporary challenges in preservation and transmission to younger generations.

The digital era presents both challenges and opportunities for cultural heritage preservation. Modern learning preferences have shifted dramatically toward visual and interactive media, creating a noticeable gap in how historical knowledge is effectively transmitted to contemporary audiences. This disconnect necessitates innovative approaches that can bridge traditional cultural content with modern technological platforms, ensuring that valuable historical narratives remain relevant and accessible.

Three-dimensional animation emerges as a powerful solution to these challenges, offering the capability to reconstruct historical events with visual fidelity and create immersive educational experiences [3]. The technology's potential for cultural preservation is further reinforced by research indicating that animation based on local heritage can significantly strengthen cultural identity and enhance public understanding of historical narratives [4]. This approach aligns with the demonstrated success of animated media in engaging Indonesian audiences, as evidenced by the widespread acceptance of local animated productions.

This study addresses the need for innovative cultural preservation methods through the development of a 3D animated video titled "Pengenalan Sejarah Pura Cedok Waru Kuta Berbasis Animasi 3 Dimensi." The production utilized Blender 3D software, following comprehensive stages of pre-production, production, and post-production. The development process incorporated thorough historical research, including field observations and consultations with temple caretakers, ensuring cultural authenticity and historical accuracy in the final output.

The completed animation underwent rigorous evaluation by multiple stakeholder groups, including media experts, cultural authorities, and community representatives. The consistently positive assessment results confirm the effectiveness of 3D animation as an educational medium for cultural preservation. This research demonstrates the significant potential of digital technology in safeguarding cultural heritage, providing an engaging and accessible means to ensure that valuable historical narratives continue to resonate with contemporary and future generations.

2. RESEARCH METHODS

This study employed a Research and Development (R&D) approach, focusing on the systematic creation and validation of a 3D animation product for cultural education. The research design followed a comprehensive framework that integrated various methodological approaches to ensure both technical excellence and cultural authenticity in the final output.

The data collection process incorporated multiple methods to gather comprehensive information. Primary data was obtained through direct field observation at Pura Dalem

Cedok Waru. In-depth interviews were conducted with temple caretakers (pengempon) and cultural experts using semi-structured protocols adapted from established qualitative research methods [5]. Secondary data was collected through extensive literature study, examining previous research findings, historical documents, and cultural archives related to Balinese temple traditions and history [1].

The development process followed a structured production pipeline comprising three main phases. The pre-production phase involved concept development, scriptwriting, and storyboarding, ensuring historical accuracy through continuous consultation with material experts [6]. The production phase implemented 3D modeling using Blender software, with character development utilizing Character Creator 4 for base models and detailed costume elements created separately. Environment assets were constructed based on field documentation and historical references, implementing realistic lighting through HDRI technology and manual lighting setups [7]. The post-production phase included video editing, compositing, sound design, and final rendering using Adobe After Effects and Premiere Pro [6].

The evaluation methodology employed a multi-dimensional validation system involving three distinct expert groups. Media experts assessed technical quality using established animation evaluation criteria, while material experts evaluated historical and cultural accuracy based on their specialized knowledge [1]. Community representatives provided feedback on educational effectiveness and engagement value. The evaluation utilized a Likert scale assessment instrument, with data analysis following the percentage calculation method [8].

The research was conducted at Pura Dalem Cedok Waru in Kuta, Bali, with the study period spanning from January to October 2025. The study population included temple caretakers, cultural experts, animation professionals, and community members, with purposive sampling techniques applied to select appropriate respondents representing each evaluation group [9]. This comprehensive methodological approach ensured the development of a culturally authentic, technically proficient, and educationally valuable animation product that effectively serves its purpose of cultural heritage preservation and education following the multimedia development lifecycle framework [10].

3. FINDINGS

The development of the 3D animation "Pengenalan Sejarah Pura Cedok Waru Kuta" followed a comprehensive production pipeline spanning pre-production, production, and post-production phases, resulting in a 7-minute 44-second educational video that effectively communicates the temple's historical narrative.

Pre-Production

The pre-production phase served as the main foundation for creating a cohesive visual and narrative structure. This process ensured all creative and technical elements were planned before entering the production stage, including concept development, storyboard creation, character design, and environment preparation that supported historical accuracy.

Storyboard Development

The storyboard process involved creating a visual script comprising 30 scenes that outlined the complete narrative flow, camera angles, character movements, and transitions. Each scene was carefully designed to ensure chronological accuracy and emotional impact, serving as a crucial blueprint for the entire production team.



Sc	Visual	Narasi
1		<i>Shoot : Wide Shoot</i>
		<i>Action : Menampilkan judul video animasi</i>
		Narasi : -
		<i>Transisi : Fade In</i>
2		<i>Shoot : Wide Shoot</i>
		<i>Action : Menampilkan landmark Pantai Jerman Kuta</i>
		Narasi : Di selatan Pulau Bali, tepatnya di kawasan Pantai Jerman, berdiri sebuah pura yang menyimpan jejak sejarah dan spiritualitas yang dalam.
		<i>Transisi : Cross Dissolve</i>
		<i>Sound : Balinese Instrumental dengan ambience suara ombak Pantai</i>

Figure 1. 3D Animation Storyboard
[Source: Writer, 2025]

Character Design Concept

Character design focused on historical accuracy while maintaining visual appeal. Key historical figures including Prabu Hayam Wuruk, Patih Gajah Mada, and Sri Astasura Ratna Bumi Banten were developed through AI-assisted reconstruction and traditional design methods, with attention to authentic clothing, accessories, and cultural symbolism.



Figure 2. Reference image of Prabu Hayam Wuruk's facial features.
[Source: Writer, 2025]



Figure 3. AI-assisted facial reconstruction result.
[Source: Writer, 2025]

Environment Design Concept

Environment concepts were created based on field research and historical references, encompassing six main settings: Pura Dalem Cedok Waru, Majapahit Kingdom interiors, coastal landscapes, and traditional Balinese architecture. Each environment was designed to support the historical narrative while providing visual richness.



Figure 4. Reference of Pura Cedok Waru based on the actual site location.
[Source: Writer, 2025]

Production Phase

The production phase represented the technical implementation of all previously prepared plans. In this phase, digital assets were developed through 3D modeling, animation, and rendering, using Blender software to create immersive visuals that aligned with the historical context.

Character Modeling

Character modeling utilized Character Creator 4 for base human models, with detailed costumes, accessories, and facial features developed in Blender. Historical figures including Prabu Hayam Wuruk, Patih Gajah Mada, and Sri Astasura Ratna Bumi Banten were created with attention to anatomical proportions, traditional clothing details, and culturally accurate accessories.



Figure 5. Character models. From left to right: Sri Astasura Ratna Bumi Banten, Prabu Hayam Wuruk, and Patih Gajah Mada. [Source: Writer, 2025]

Rigging Process

The rigging process involved creating skeletal structures for all characters using Blender's Rigify add-on. Each character received a complete armature system with proper weight painting to ensure natural deformation during movement. The rigging included facial controls for expressions, finger controls for detailed hand gestures, and IK/FK systems for flexible limb animation, enabling realistic character performances throughout the historical narrative.



Figure 6. Character rigging process using Rigify. [Source: Writer, 2025]

Environment Modeling

Environment assets included detailed reconstructions of Pura Dalem Cedok Waru's architectural elements, Majapahit Kingdom structures, and coastal landscapes. The modeling process focused on architectural accuracy, spatial relationships, and environmental elements that supported the historical narrative, using a combination of polygon modeling and texture mapping techniques.



Figure 7. 3D model of Pura Cedok Waru. The Jaba Area and the Penataran Area.
[Source: Writer, 2025]



Figure 8. 3D Majapahit environment models, featuring the outdoor and indoor areas.
[Source: Writer, 2025]

Property Modeling

Key props were modeled to enhance historical authenticity, including the Majapahit jong ship and waru trees. The ship was designed based on historical references of traditional Majapahit vessels, while the waru trees were created using particle systems for leaves and detailed bark textures to replicate their distinctive appearance in the temple's environment.



Figure 9. 3D model of the Majapahit “Jong” ship.
[Source: References [11]]

Animation Process

Animation employed keyframe techniques and pose-to-pose methodology to bring characters to life. The process included creating realistic movements for walking, gesturing, and facial expressions, with particular attention to cultural authenticity in character behavior and interactions.



Figure 10. Animation process using the pose-to-pose method.
[Source: Writer, 2025]

Lighting and Rendering

Lighting combined HDRI for natural outdoor scenes and strategic artificial lighting for interiors to enhance mood and historical atmosphere. Rendering utilized Blender's Cycles engine with optimized settings to balance quality and efficiency across 30 scenes.

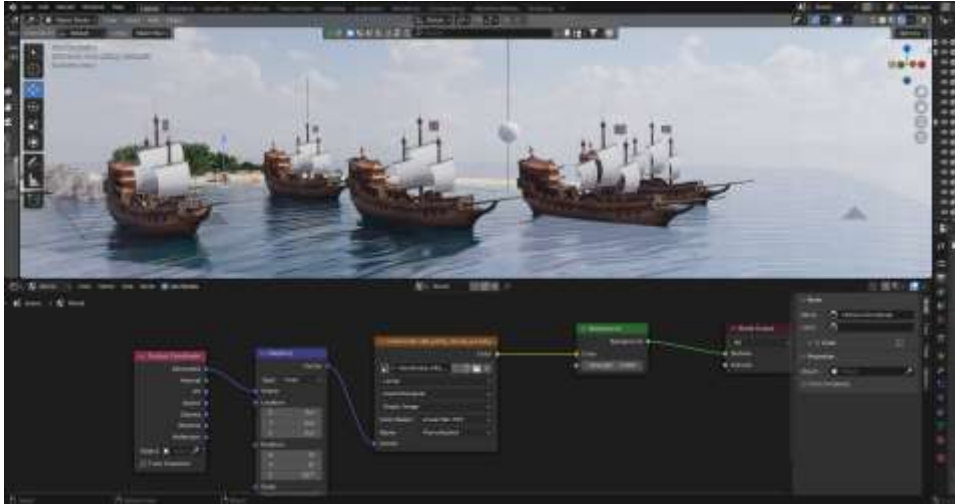


Figure 11. Lighting setup using an HDRI environment.
[Source: Writer, 2025]

Post-production Phase

The post-production phase unified all visual and audio elements into a complete work. The compositing, sound design, and final rendering processes were carried out to refine video quality and ensure effective and engaging delivery of the historical narrative.

Compositing and Editing

The compositing stage integrated all rendered elements through Adobe After Effects and Premiere Pro, involving color grading, scene transitions, and visual effects enhancement to ensure narrative continuity and visual consistency throughout the animation.

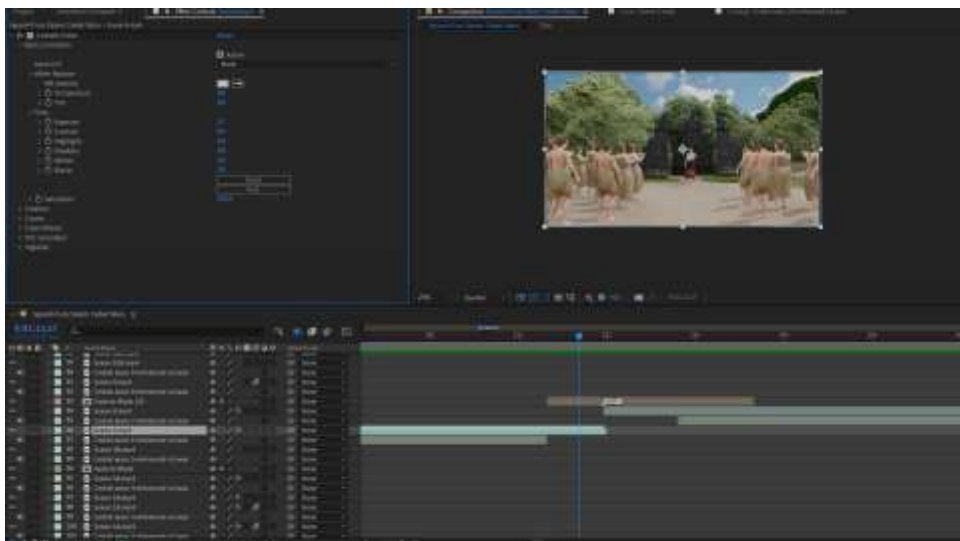


Figure 12. Compositing and editing process for the final scene.
[Source: Writer, 2025]

Sound Design and Voice Over

Sound design incorporated professionally recorded narration, ambient sound effects, and culturally appropriate background music featuring gamelan compositions. The audio elements were synchronized with visual sequences to enhance emotional impact and historical immersion.

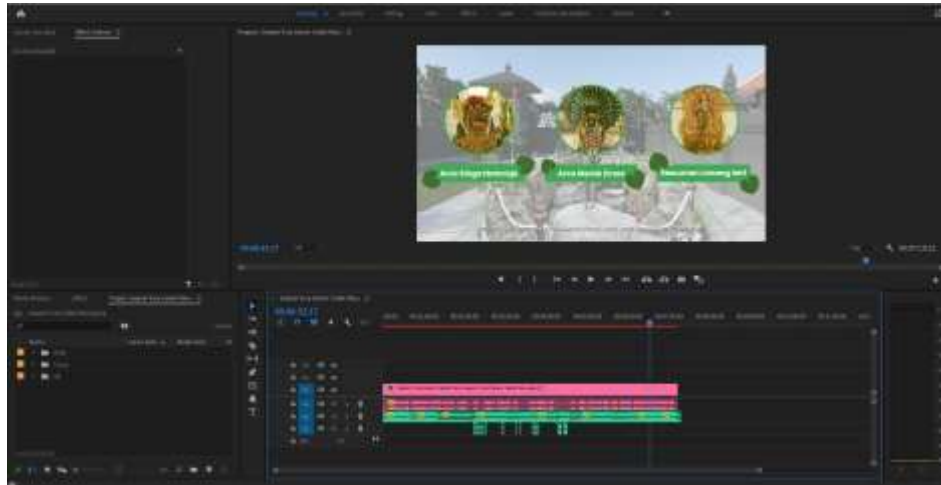


Figure 13. Sound design process, including voice-over, sound effects, and background music. [Source: Writer, 2025]

Final Output

The final rendering produced a High Definition video (1920x1080, 30fps) suitable for educational and public viewing purposes, incorporating all visual and audio elements into a cohesive narrative that effectively communicates the historical significance of Pura Dalem Cedok Waru.

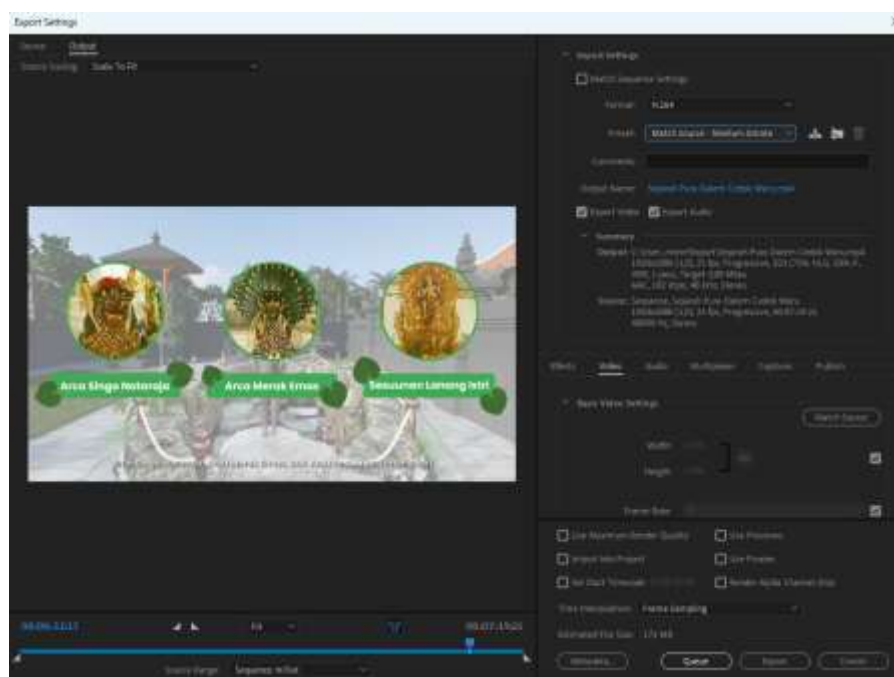


Figure 14. Final render displayed and finalized in Adobe Premiere Pro. [Source: Writer, 2025]

4. CONCLUSION

This research has successfully demonstrated the viability of 3D animation as an effective medium for cultural heritage preservation through the development of "Pengenalan Sejarah Pura Cedok Waru Kuta Berbasis Animasi 3 Dimensi." The study proves that digital technology can successfully reconstruct historical narratives while maintaining cultural authenticity and engaging modern audiences. The comprehensive production process, encompassing pre-production planning, technical execution in production, and final polishing in post-production, has resulted in a 7-minute 44-second educational video that effectively communicates the temple's historical significance. The animation's successful visualization of key historical events and characters from the Majapahit Kingdom era, combined with its technical achievement using Blender 3D software, establishes a new approach to cultural education that bridges traditional heritage with contemporary digital storytelling methods.

Based on the research findings, several strategic recommendations are proposed for future development. For educational implementation, the animation should be integrated into local curricula with supplementary materials and multilingual versions. Technically, future work should explore real-time rendering, interactive features, and mobile applications to enhance accessibility. For cultural preservation, establishing digital archives and community collaborations would help extend this approach to other heritage sites. Subsequent research should investigate the long-term impact of digital cultural education and explore emerging technologies like VR and AR. This study provides a replicable framework for digital heritage preservation that can be adapted to various cultural narratives, ensuring their continued relevance in the digital age.

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