Studying the History of Temple Relief in Malang Using Textbooks Based on Augmented Reality

Hariyanto*, L Sidyawati & S D Anggriani

Abstract

The history of classical Indonesian art, especially the Hindu-Buddhist era, has rarely been studied in universities. Teaching materials for the course of Indonesian art history are more focused on the material of Indonesian modern art history. Hindu-Buddhist temples from the Singosari and Majapahit era have high cultural values so that they are a source of cultural knowledge and have considerable cultural tourism potential. To attract students' interest in learning the history of Hindu-Buddhist art, especially the history of Singosari relics in Malang, an interesting media is needed, which is textbooks based on Augmented Reality (AR). Textbooks are equipped with story relief drawings that are given markers so that when viewed using a smartphone with the AR application, the photographic images will turn into color illustration images with digital techniques. The purpose of writing this textbook in addition to increasing interest in learning the history of Indonesian art is also intended that students love Indonesian cultural heritage, especially temples in the Greater Malang area. This textbook is focused on presenting relief stories contained in temples in Malang. This research uses the historical and development methods, where the writing of the book is used the historical method, while the book design and AR application are used by the simplified Borg and Gall research and development method. The contents of the book consist of relief stories of the Anglingdarma Jago temple, relief stories Garudeya Kidal temple, reliefs non-stories from Singosari temple, Badut temple, and Sumberawan temple.

Keywords

Temple reliefs, textbooks, Augmented Reality (AR)

Address for Correspondence:

*Hariyanto (hariyanto.fs@um.ac.id)
Art and Design Department, Faculty of Letter, State University of Malang, Indonesia

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1. INTRODUCTION

The Hindu-Buddhist cultural heritage in East Java, such as oral traditions, classical literature, folk theater, and temple architecture, is still relatively alive in the community, although it is less attractive to students and local researchers. Several relics of Sengosari and Majapahit temples are found in Malang Regency such as Sengosari temple, Jago temple, Kidal temple, and others. In Jago, Kidal, and Badhut temples, there are narrative reliefs sourced from Indian classical literature and local literature. The stories carved on temples in East Java are still interesting to study, for example, the relief of *Tantri* (Brown, 1998), the story of *Angling Dharma* (Drewes, 1975), the relief of *Aridharma* (Hunter, 2000), relief and statue of *Panji* (Kieven, 2013; Kumar, 2020), the story of *Adiparwa* (Turaeni, 2015), reliefs and statues of *Garuda* (Scheurleer, 2009), the statue of *Dewi Durga* (Santiko, 1997). The narrative reliefs at Candi Jago, Candi Kidal, and Candi Badhut cannot be separated from literary works and myths or legends that have developed in the communities around the temple. Narrative relief is a visualization of literature and myths that have existed before.

The purpose of the temple was built as a monument to a deceased king, Jago temple to commemorate King Wisnuwardhana, and Kidal temple to commemorate Anusapati. The stories carved on the temple walls in the form of narrative reliefs have a positive desire, or a good desire for life (Munandar, 2019). The narrative reliefs in East Java temples contain “mythological stories” originating from India in the form of *kakawin*, and “post mythological stories” originating from East Java in the form of *kidung* (Forge, 1978; Kieven, 2013, 2014). The post-mythological story that is still alive in Javanese society, especially East Java is the *Panji* story. Until now, *Panji*’s story is not known who the author is, however, this story appears in various forms of art such as literature, fine arts, performing arts, and ritual ceremonies. The *Panji* tradition is an example of a living cultural heritage to be practiced, preserved, and transformed (Kieven, 2018). *Panji* stories in reliefs are not just entertaining tales, but have a high religious meaning and symbolism (Kieven, 2014), as well as being a model or role model for Javanese kings (Kumar, 2020).

The narrative reliefs in the temples in Malang, especially Jago and Kidal temples, are still the object of research and objects of scientific study from various fields of science. Utami and Lutfi (2019) in an article entitled “Effectivity of Augmented Reality as Media for History Learning” shows that the Augmented Reality (AR) application is very effectively be used as a medium for learning history of Sengosari temple, Jago temple, and Kidal temple. Fauzi (2019) adapts the reliefs of the Jago temple into stories for children, intending to be able to convey local stories through popular media. Arya Pageh and Gede (2020) adapting the story of *Tantri Kamandaka* into a digital comic to discover the values of national character education. Utami et al. (2018) developed batik motifs derived from relief motifs in the Kidal temple.

The narrative reliefs carved on the walls of the Jago temple consist of two groups of stories originating from Buddhist and Hindu teachings. Buddha's teachings are reflected in the relief stories of *Tantri Kamandaka, Kunjarakarna* stories, and *Angling Dharma* (Ari Dharma) stories. Reliefs containing Hindu religious teachings are *Parthayajna* and *Arjuna Wiwaha* which are excerpts from the *Mahabharata* story. The story of *Angling Dharma* is still popular in Javanese society and has been produced in the form of an electronic cinema series on private television. The relief of the *Angling Dharma* (Ari Dharma) story has a moral message, namely: 1) not to silence a crime that will or has occurred; 2) all sins will be rewarded and will not be approved by the gods; 3) gratitude for the help of others and reciprocating even the most precious things; 4) if you want to give kindness you don't need to show yourself; and 5) loyalty and honesty towards their life partner (Wahyudi & Jati, 2014).

On the walls of the Kidal temple, there is only one narrative relief, namely *Garudeya*, which is derived from the *Adiparwa* book. Garudeya’s story describes a hybrid creature with a human body and an eagle head, in mythological terms, it is called therianthropy (Sugihartono et al., 2020). The eagle struggles to free his mother named Winata from Kadru’s slavery. Requirements to free his mother, *Garuda* must look for the holy water of *Amerta*. The myth depicted in the *Garudeya* relief is believed
by the local community to be a form of ruwatan (safety ceremony) that Anusapati wanted from his mother Ken Dedes. His love for his mother encouraged Anusapati to make a temple for his prayer to symbolize the story (Zain, 2018).

In the Kunjarakarna reliefs in the Jago temple, there is a figure of a man in a hat who usually accompanies the Panji character in narrative reliefs in Majapahit temples (Kieven, 2017). The Panji story is not only known in Java and Bali but has spread to Malaysia, Thailand, Burma, and Cambodia since the Majapahit era (Vickers, 2014; Joll & Aree, 2020). Panji's story has also transformed various forms of visual art such as wayang beber, wayang masks, wayang krucil, Balinese wayang, Balinese wayang painting, and so on. Putra (2018) shows that the visualization of Panji figures in Balinese puppets and Kamasan paintings is similar to the visualization of Panji on the reliefs of the Jago temple.

The transformation of stories based on Indian mythology and stories originating from local stories such as Panji into various forms of modern media such as folklore books, fiction books, picture books, comics, electronic cinema, animation, and so on shows that these classic stories still have traction among modern society. To keep the traditional culture of the archipelago sustainable, new media is needed that is in accordance with the present. Textbooks for the Indonesian Fine Art History course need to be enriched with local materials. Therefore, the material on narrative reliefs on temples in the Malang region will be added to the existing teaching materials in the course of History of Indonesian Fine Arts.

In the context of cultural-historical theory, textbooks are treated as cultural products that have an important cultural mission, namely the formative influence of textbooks on individual development and the role of textbooks in the cultural reproduction of society (Plut & Pešić, 2003). Teaching materials contain learning materials that need to be studied by students, both in print and facilitated by the teacher so that learning objectives can be achieved (Dick et al., 2005). Teaching materials can be in the form of images or sound images that can be used as an alternative to communicating in the learning process. One of the easiest forms of teaching materials to use is teaching materials in printed form, such as textbooks (Opara & Oguzor, 2011). Picture books appeal to readers of all ages and although they are shorter than novels, many are very sophisticated (Ciecierski & Bintz, 2015).

Azuma (2013) defines augmented reality as an amalgamation of real and virtual objects in a real environment, running interactively in real-time, and there is an integration between objects in three dimensions, namely integrated virtual objects in the real world. The combination of real and virtual objects is possible with suitable display technologies, interactivity is possible through certain input devices, and good integration requires effective tracking (Haller et al., 2006). AR refers to a situation where the goal is to complement the user's perception of the real world through the addition of virtual objects (Azuma, 2013).

Broadly speaking, the methods used in Augmented Reality are divided into two, namely "Marker Based Tracking" and "Markerless Based Tracking" (Raj et al., 2015). Marker-based tracking is an AR method that uses markers to create virtual objects; while using the markerless method the user does not need a marker to display virtual objects. The markerless method can be applied using GPS, motion (gestures), face tracking.

Vuforia is an AR Software Development Kit (SDK). Vuforia SDK allows the development of AR on mobile devices. This image recording capability allows developers to position and direct virtual objects, such as 3D models and other media, concerning real-world objects when they are viewed through a mobile device camera. This SDK itself has various interesting features such as scanning objects, scanning text, recognizing marker frames, virtual buttons, smartly identifying object surfaces, cloud-based scanning, recognizing image targets, recognizing cylindrical object targets, and recognizing predefined target objects (Putra, 2015).
In this research, a textbook of temples and reliefs equipped with markers was produced. This book can be called an AR book (AR-Book). AR-Book is a combination between ordinary books and AR technology. AR-Book in general has two main components, namely a book equipped with a marker (Sudyatmika et al., 2014). This AR book is a specially designed learning resource, as a component to make it easier for users to understand the contents of the book by displaying 3-dimensional objects in 2-dimensional images.

2. METHOD

This research uses a qualitative approach and more specifically the historical method. The qualitative approach is indicated by data collection through observation, documentation, and interviews. Data analysis with a flowing model from Miles et al. (2014) includes data reduction, data presentation, and verification. To test the validity of the data, sources and methods were triangulated. This research also uses historical methods which consist of topic selection, heuristics (data collection), source criticism (internal and external), interpretation, and writing or historiography (Kuntowijoyo, 2003). Data collection using the method of observation, literature review, and visual studies. Source criticism is done by testing the validity of text data and visual data (when, where, by whom, integrity, and credibility of data sources). Interpretation is the stage of interpreting data, events, visual works so that a complete meaning is obtained. Historiography is the activity of writing (history) following the author's style and adjusting the norms and ethics of writing.

The following is a flowchart of the research process using the Bukuajar “Relief Nusantara” based on AR in the Indonesian Fine Art History course (Figure 1 and 2). The research steps for the preparation of the Bukuajar “Relief Nusantara” based on AR include: AR book ideas, data collection, and preparation of book manuscripts, data analysis, taking relief images as markers, making illustration and animation images, marker input to the Vuforia portal, AR camera configuration, making target images in Unity software, and Build and Run the Relief Nusantara application.

![Figure 1 - The stages of the preparation of the AR Relief Nusantara book](image-url)
3. FINDINGS

The Relief Nusantara textbook based on AR is printed on HVS paper, with a size of 25 x 18.5 cm, consisting of 20 pages, complete with color pictures, some of the pictures serve as markers, the temple relief images which are marked with are taken from narrative reliefs found in the temple Jago, Kidal temple, and Badhut temple. The contents of the book include: Book Cover, Foreword, Table of Contents, Candi Jago, Candi Kidal, Candi Badhut, Candi Sumberawan, and Candi Singosari (Figure 3).

The focus of this textbook is the relief stories found in three temples, namely Candi Jago, Candi Kidal, and Candi Badhut. The relief chosen from the Jago temple is the story of Angling Darma or Ari Darma. In Kidal temple there are reliefs of Garudeya in three versions, namely Garudeya carrying a jug, Garudeya carrying his mother (Ken Dedes), and Garudeya carrying a snake. The reliefs chosen from the Badhut temple are the reliefs of Durga Mahisasuramardini.

Reliefs published in the Relief Nusantara textbook come from temples in the Greater Malang area and are only focused on story reliefs. This is done because of the consideration that the story reliefs contain educational values that are still relevant today. The relief panels of Angling Darma in Jago temple are long enough so that the researcher focuses only on the main character's scene, for example, Angling Darma with his wife, Angling Darma with his grandfather, Angling Darma with a snake, and so on. The following shows several sections of textbooks, namely book covers, temple description pages, and pages that present relief stories (Figure 3 and 4).
Figure 4 - Ari Darma relief description page is equipped with a “SCAN ME” marker

Figure 5 shows the workflow of the Relief Nusantara application, starting with the user pointing the smartphone camera at the relief image (marker), after the marker is tracked, a color illustration will appear on the screen as an interpretation of the relief image of the temple. In the example of Figure 4, it can be seen that the relief pieces of Angling Dharma killing a dragon are visualized in a decorative and caricature manner with an unclear background. The illustrator in this study deliberately reinterpreted the Angling Dharma relief image by adding color and a realistic impression. The illustrator interprets Angling Dharma holding a machete in the right hand, while the left hand holds a kind of bow. Visualization of illustrations in addition to color is also presented in a proportional and natural form so that it is more communicative. The results of the illustrator's interpretation of the temple relief images (Jago) show that the illustrator as an adaptation or vehicle transfer actor has the freedom to interpret the original object. This interpretation is a reflection of the spirit of an era that is different from when the reliefs were produced as an interpretation of oral stories and literary works at that time.

The design of this AR textbook is validated by media experts and history/cultural studies experts who have expertise and experience in their fields. The results of the validation from media experts show a score of 88%, which means that the validity of the media aspect is very good. Based on the results of filling out the questionnaire by history/cultural studies experts, it was obtained a score of 80% which means that the validity of the material aspect is good. To test the effectiveness of the AR textbook design, the researchers conducted a pre-test and try-out on 10 students participating in the Indonesian Fine Art History course. During the pre-test without using the AR book, the average of the student's
comprehension of the narrative reliefs of temples in Malang was still not good, it was shown with a score of 51.4%. The results of the AR book design trial on 10 students showed a high score of 86.6%, which means that this book is very suitable for use (Figure 6). Some suggestions from media experts and history/cultural studies experts have been accommodated by revising the appearance and content of the book so that the book becomes better.

![Figure 6 - Scores of pre-test and post-test of student's comprehension of narrative reliefs](image)

4. DISCUSSION

Narrative relief is a form of transformation from oral literature to written literature, then to visual forms. The change from oral media to written media, then to visual to audio-visual media is a process of transferring a vehicle. According to Damono (2012), the transfer of vehicles includes activities of translation, adaptation, and transfer from one type of art to another. The process of transferring vehicles in narrative art has occurred since the days of the Kediri, Singasari, and Majapahit kingdoms. The narrative reliefs from the mythological to post-mythological eras in East Java temples, especially the narrative reliefs at the Jago temple have been adapted into the form of Balinese shadow puppets and traditional Kamasan painting (Putra, 2017; Putra, 2018).

Visual language is more effective than written and spoken language, this can be seen in the cone of experience of Dale (1969), where verbal language is at the top of the pyramid, visual language is in the middle, while role-playing, simulation, and real work are the most common experiences. Making a reproduction of a relief image in the form of an illustration can be considered as an act of adaptation. Basically, adaptation is a way to rewrite the same story but from a different perspective (Hutcheon, 2006).

The essence of the *Relief Nusantara* textbook is to produce a change from a black-and-white image (photo) of a temple relief with simple decorative visualization produced through stone carving to a color digital image, to a realistic visualization using hand drawing techniques and digital drawing. The adaptation from relief to digital images actually takes the form of a visual vehicle, what distinguishes it is the media used, namely stone with the chisel technique onto paper media with digital drawing techniques and can be accessed with a smartphone equipped with an AR application.

Many studies show that color can increase readership by as much as 40 percent, learning from 55 to 78 percent, and comprehension by 73 percent (Morton, 2019). Color ads are read up to 42% more often than the same ad in black and white (Morton, 2019). Test results show that black and white images can sustain less than two-thirds of interest per second, while color images can hold attention for two seconds or more (Morton, 2019). Research shows that primary education students in years 4 and 5 prefer color pictures to black-and-white images. In addition, many people prefer color visuals to black-and-white visuals (Yasar & Seremet, 2007).
5. CONCLUSION

The use of the AR-based Relief Nusantara textbook can increase student interest in learning the history of Indonesian Hindu art, especially in the Greater Malang area. The increased interest in learning is supported by the efforts of illustrators and researchers to produce digital illustration images as a new interpretation of the temple relief images whose shape is increasingly blurred. The adaptation of the stone relief images in the Jago, Kidal, and Badut temples allows the researcher to update the visualization of the narrative reliefs so that they are different from the original objects. The adaptation and transfer of rides from relief images to digital illustration images allow cellphone users (students) to easily access the application. By utilizing AR technology, it is hoped that learning the history of Indonesian art will be more interesting. In addition, this Relief Nusantara textbook can also help campaign for cultural heritage preservation.

REFERENCES


