

Ethnozoology Study of Horse Symbolism (*Equus caballus*) in Karmawibhangga Reliefs of Borobudur Temple: Relevance to Character Education Values

Rintan Sahputri¹, Serafica Btari Christiyani Kusumaningrum², Setiyo Prajoko^{3*}

^{1,2,3} Tidar University, Indonesia

*Corresponding Author: setiyoprajoko@gmail.com

ABSTRACT

This study aims to describe the ethnozoological symbolism of horses (*Equus caballus*) in the Karmawibhangga reliefs of Borobudur Temple and their relevance to character education values. Using a descriptive ethnographic method with a qualitative approach, data were collected through observation, documentation, literature study, and semi-structured interviews involving two expert informants: zoologist and archaeologist. Thematic data analysis was conducted to reveal the symbolic meanings and character values. The results showed that the horses visualized on five panels (93, 129, 132, 150, and 159) had a high similarity rate in body proportions to actual horses, reaching 90.83%. Symbolically, horses represent bondage, social status, glory, strength, loyalty, and peace, reflecting the dualism of karma. They support the main narrative to manifest six character education values: religiousness, responsibility, social care, generosity, peace-loving, and environmental care. In conclusion, the horse symbolism is a tangible manifestation of human moral qualities that reinforces cultural identity and environmental ethics. These findings can serve as a source of biological literacy that integrates ethnozoology in preserving local wisdom amidst modern development. Furthermore, they can also provide inspiration for educators in implementing contextual learning that internalizes character values.

Keywords: character education values. ethnozoology, horse (*Equus caballus*), karmawibhangga

INTRODUCTION

Borobudur Temple is the largest Buddhist masterpiece on the island of Java and a UNESCO World Heritage Site (Febrianto & Idris, 2016). The temple is located in Borobudur Village, Magelang Regency, Central Java Province, and was built around the 8th century AD by the Syailendra Dynasty (Samvara, 2023; Utami et al., 2020). Borobudur Temple was recognized by the government as a National Strategic Area (KSN) in 2008 based on Government Regulation No. 26, making it one of the rapidly developing international cultural tourism locations in Central Java (Andina & Aliyah, 2021). Inside the temple, there are two types of reliefs, namely decorative reliefs that are symbolic in nature and narrative reliefs that are often referred to as story reliefs (Ardiyansyah et al., 2020). The story reliefs carved on the walls have various meaningful decorations and contain three types of narratives: (1) panels with sequential stories (Lalitavistara, Gandavyuha, and

Gandavyuha-Bhadracari); (2) panels that tell short stories (Jataka-Avadana); and (3) panels with single written story images (Karmawibhangga) (Achmadi et al., 2020). One of the scientific values contained in the story reliefs at Borobudur Temple is that they serve as a tool for understanding the natural and cultural conditions of society in Ancient Java (Ardiyansyah et al., 2020).

One important component of Borobudur Temple is the Karmawibhangga Relief, which illustrates interactions between humans, nature, flora, and fauna while depicting the Buddhist concept of karma and the consequences of good and bad deeds (Damai, 2020). However, studies linking this to character education are still limited (Setiawan, 2020). According to Santiko and Nugrahani (2012), the scenes in the relief depict human life in its interactions with the environment and with fellow humans. One of the fauna that appears in several panels is the horse (*Equus caballus*). Biologically, the horse belongs to the family Equidae and possesses distinct morphological features, such as strong hooves and a muscular body designed for speed and endurance, functioning as a grazing herbivore (Efendi, 2026). From an ethological perspective, horses exhibit natural behaviors, such as high sensitivity to their surroundings and auto-grooming, which indicate their adaptability and emotional states. Furthermore, Indonesia has 13 local horse species, including Gorontalo and Minahasa, Makassar, Sumba or Sandalwood, Bima, Flores, Savu, Roti, Timor, and Sumatran horses (which include the Padang, Batak, Agam, and Gayo horses), alongside others like the Bali, Lombok, and Kuningan horses. These local breeds generally possess distinct advantages as riding and racing horses (Gaina, 2023). Horses are also recognized as highly strategic working livestock with significant aesthetic value (Sari, 2018). Consequently, horses are widely known for their strength, intelligence, and nomadic traits (Wibisono et al., 2017). In cultural contexts, horses frequently serve as symbols of social status and power. The animals depicted in the panels not only fulfill an aesthetic function but also enrich the storyline, carrying profound symbolic meanings (Febrianto & Idris, 2016; Metusala et al., 2020). Studying fauna in archaeology is an important field of study for understanding human history, such as the practical and sacred uses of fauna in human life and death (Idris & Sepriady, 2017).

Modern education tends to emphasize intellectual development and rational thinking skills while giving less attention to emotional and character development (Nurfalah, 2016). The changing times are one of the reasons for the younger generation's lack of understanding of the values of character education in their lives. In fact, understanding these values is crucial for the younger generation to be able to face the various challenges of the modern era (Lickona, 2018; Wulandani et al., 2021). Character education is the foundation for creating a harmonious and dignified society and a guideline for deviant behavior in line with the development of the digital era (Kemdikbudristek, 2022; Sari et al., 2023). Philosophically, character education is a rational and relevant field of study because it discusses human behavior that will not fade with the changing times (Nurfalah, 2016). In his research, Syahputra (2020) explains that the noble values contained in every local wisdom and culture should reflect character values and can be used as a basis for character education (Syahputra, 2020). Biology is not merely a modern science; it also encompasses biological knowledge embedded within cultural heritage. Thus, cultural

heritage such as Borobudur Temple can be interpreted from an ethnozoological perspective. Ethnozoological studies focus on exploring zoological information, understanding the community's cultural perceptions regarding animal utilization, and supporting environmental conservation efforts (Putri et al., 2025).

Previous studies have been conducted on the reliefs at Borobudur Temple, particularly those focusing on identifying the flora and fauna depicted therein. One study identified 63 plant species in the Lalitavistara Relief, reflecting the level of awareness among the people of Ancient Java regarding biodiversity (Metusala et al., 2020). Another study successfully identified symbolic fauna, particularly mammals, in the story depicted in the Lalitavistara Relief at Borobudur Temple, which provides an insight into the Ancient Javanese society's understanding of local fauna through the existence of various mammal species (Achmadi et al., 2020). A different study was also able to analyze the visualization of rice plants on panel 65 of the Karmawibhangga Relief, which shows the relevance of rice to the cultural, economic, and spiritual values of the society at that time, as well as its role as a symbol of prosperity resulting from good deeds in the teachings of karma (Anggoroajati et al., 2023). Other studies also show that the Karmawibhangga Relief contains 10 of the 18 character education values formulated by the Ministry of Education and Culture (Saputro, 2024). However, there has been no ethnozoological study that explores the symbolism of horses in the Karmawibhangga Relief and its relevance to character education values. The representation of horses in the Karmawibhangga Relief needs to be explored in depth, not merely as an element of visual art, but as a symbol that conveys moral messages and the relationship between humans, animals, and nature.

Therefore, this study aims to describe the symbolism of the horse (*Equus caballus*) in the Karmawibhangga Reliefs of Borobudur Temple from an ethnozoological perspective and its relevance to character education values. Readers learn to recognize animal body shapes and behaviors through visual representations within a historical context. Consequently, they not only understand animal morphology but also realize how humans in the ancient Javanese period observed and utilized animals in their daily lives. Thus, this research is expected to serve as a meaningful biological literacy resource that supports biology education in becoming more contextual. Furthermore, it can encourage the strengthening of national identity through the preservation of cultural heritage and the internalization of character values within society.

METHOD

This study employed a descriptive ethnographic design with a qualitative approach, which aims to understand and describe the symbolism of horses (*Equus caballus*) in the Karmawibhangga Relief at Borobudur Temple and find its relevance to character education values. Through ethnography, researchers examine culture and symbolic meaning in depth based on the realities of people's lives (Creswell, 2018, pp. 90–92). This research was conducted in 2025 at Borobudur Temple, Magelang Regency, Central Java Province, Indonesia. The population in this study included all 160 panels of the Karmawibhangga Relief (Figure 1). The research sample focused on five panels representing horses, namely

panels 93, 129, 132, 150, and 159. The Karmawibhangga Relief map is located at the base, which is covered by the Borobudur Temple corridor structure (Figure 1).

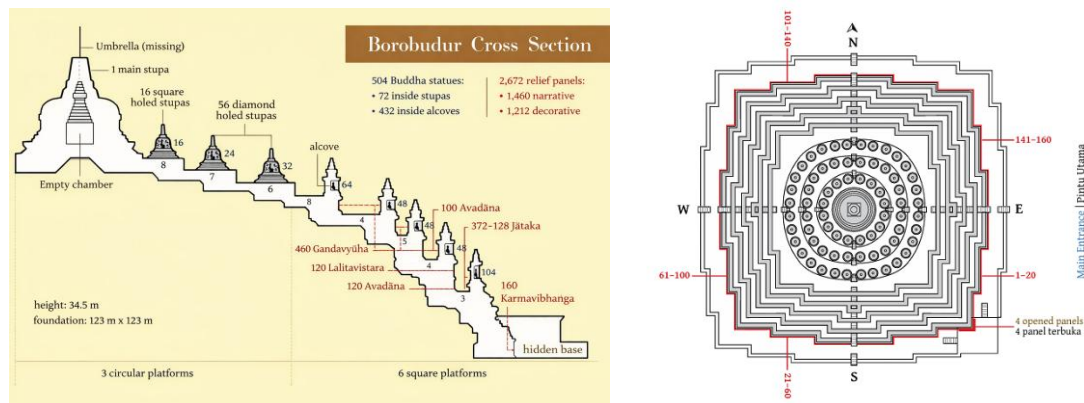


Figure 1. The structure of Borobudur Temple and the Karmawibhangga Relief Map, which is hidden at the base of the temple (Source: Anandajoti Bhikkhu, 2020).

The research procedure consisted of two main stages (Figure 2). The first stage, exploration and identification, was carried out through observation and documentation of the Karmawibhangga Relief of Borobudur Temple, which depicts horses, and supporting information from relevant literature archives. The second stage involved the analysis of symbolic meaning and character values. The results of the interpretation of symbolic meaning were then linked to moral teachings in Buddhism to find their relevance to character education values.

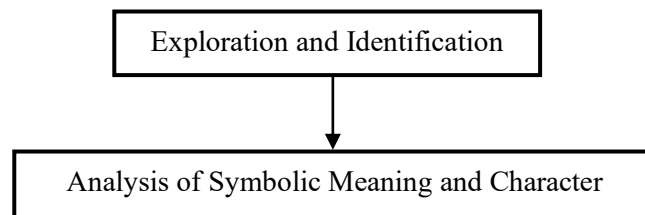


Figure 2. Ethnographic Research Procedure

Data collection techniques in this study included observation, documentation, interviews, and literature review. Direct observation was conducted on several open relief panels, while indirect observation was conducted through archives available at the Borobudur Museum and Cultural Heritage. Semi-structured interviews were conducted with two key expert informants: one archaeologist serving as a temple maintenance staff at MCB Borobudur to explore the symbolism of the Karmawibhangga Reliefs and one zoologist who is a horse trainer and keeper to confirm the biological aspects of the horses. To ensure the scientific validity of the findings, this study employed both source triangulation and methodological triangulation. Source triangulation was carried out by cross-referencing data from the different key informants. Meanwhile, methodological triangulation involved combining several data collection techniques, specifically by comparing interview data with the results of observations and relevant literature.

The research instruments used included: (1) observation sheets for horses in the karmawibhangga panels; (2) observation sheets for identifying actual horse species, including morphometric analysis to compare horses in the reliefs with actual horses; and (3) interview sheets containing open-ended questions for expert informants. The visualization of horses in each relief panel was traced using CorelDraw Graphics Suite 2019 to facilitate visual interpretation.

Table 1. Observation instrument grid for horses on the Karmawibhangga Relief at Borobudur Temple

Observed aspects	Grid
Panel data	Panel number and panel position
Visual morphology	Physical description of the horse includes body proportions, body shape/position, visible body parts, and attributes worn by the horse
Narrative context	The horse's role in the scene (including the horse's function)
Symbolic meaning	Interpretation of the horse's presence in a cause-and-effect context

Table 2. Observation instrument grid for identifying real (actual) horses

Observed aspects	Grid
Biological aspects	Identification of species, physical characteristics of horses, and morphometric measurements as a comparison with horses in relief
Behavior	Horse activities or habits and interactions between horses and humans
Environmental conditions	Horse habitat in the environment

Table 3. Semi-structured interview grid with expert archaeologist informants

Topic	Sub-topic
Background and expertise	Educational background and experience of the source related to Borobudur Temple, especially the Karmawibhangga Relief
Relief identification	Depiction of horses in the panels and information about the sculptors of the Borobudur Temple reliefs
Interpretation of meaning	The symbolic meaning of horses in Buddhist teachings in Karmawibhangga
Ethnozoology	The role of horses in the life of ancient Javanese society
Educational relevance	Character values that can be derived from the symbolism of the horse

Table 4. Semi-structured interview guide with zoology experts

Topic	Sub-topic
Background and expertise	Educational background and experience of the informant in caring for horses
Biology	Physical characteristics, physical traits and body proportions, differences between males and females, adaptations, feeding patterns, and daily activities of horses

Cultural symbolism

Societal views and the role of horses in human life relevant to character values

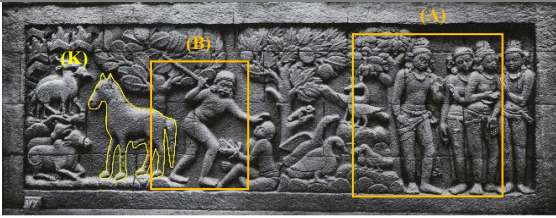
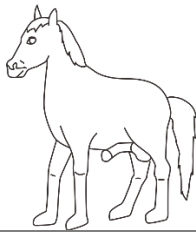
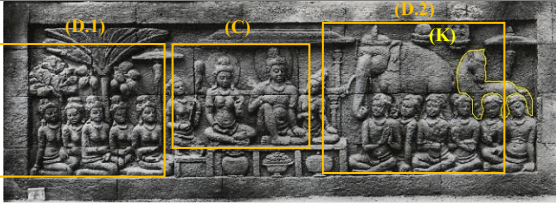
Data analysis in this study was conducted thematically, referring to Creswell (2018), reinforced by the analytical concepts of Miles, Huberman, and Saldaña (2014), which includes five stages, namely: (1) data organization, (2) comprehensive reading, (3) data classification, (4) data generalization, and (5) data presentation (description) of symbolic interpretation.

RESULT AND DISCUSSION

Results of Visual Identification of Horses

Five relief panels depicting horses (*Equus caballus*) were found in Karmawibhangga, namely on the west side of panel number 93, the north side of panels number 129 and 132, and the east side of panels number 150 and 159. These reliefs are scattered on sides that have been covered by thousands of stone blocks.

Table 5. Visualization of Horses (*Equus caballus*) in the Karmawibhangga Reliefs at Borobudur Temple

Gender	Panel Number	Relief Image	Horse Sketch
Male	93	 (Source: Borobudur Conservation Office documents)	
Unidentified	129	 (Source: Borobudur Conservation Office documents)	
Unidentified	132	 (Source: Borobudur Conservation Office documents)	
Unidentified	150	 (Source: Borobudur Conservation Office documents)	

Unidentified
d 159



(Source: Borobudur Conservation Office documents)



Based on Table 5, it is known that on panel number 93, located on the west side of Borobudur Temple, the horse (K) is standing among other animals such as buffalo, deer, cows, and birds. Morphologically, the horse is visualized in its entirety from the side, showing a slender body with an upright head, neck, chest, legs standing upright, and a tail hanging down. Here, the horse appears to be unadorned. Based on the identification of primary sexual characteristics, the horse is identified as male due to its clearly carved reproductive organs, namely the penis and scrotum.

Panel number 129 is located on the north side of Borobudur Temple, with a horse (K) standing in the background close to an elephant. Here, the horse is seen with its neck slightly turned backward, sticking out its tongue as if licking its own body. The horse wears an attribute on its head. Morphologically, the visualization of the horse in this panel is not complete because part of its body is covered by other visual elements, namely the figures of the guards who are seen sitting in front of it. The visible parts include the head, neck, shoulders, front legs, and tail hanging down. The sex of the horse cannot be identified because the inguinal area is covered.

Panel number 132 is located on the north side of Borobudur Temple, with the horse (K) standing in the background next to an elephant. The horse wears an attribute on its head. Morphologically, the visualization of the horse in this panel is not complete because part of its body is covered by other visual elements, namely the figures of guards sitting in front of it. The visible parts include the chest, front legs, upright head, and shoulders. The sex of the horse cannot be identified because the inguinal area is covered.

Panel number 150 is located on the east side of Borobudur Temple, with the horse (K) standing close to the elephant. Here, there is a palanquin, and it appears to be ridden or used for mobility by other elements, so its body is not fully visible. Morphologically, the visible parts include the head, neck with attributes, and chest. The sex of the horse cannot be identified because the inguinal area is covered.

Panel number 159 is located on the east side of the foot of Borobudur Temple, with the horse (K) in a standing position and its head turned backward. Morphologically, the horse's body is not fully visible because it is mostly covered by the elephant in front of it. Only the head, part of the neck, and shoulders are visible. The horse has attributes on its head, neck, and body. The sex of the horse cannot be identified because the inguinal area is covered.

Result of Horse Morphometric Calculation

Morphometric calculations were obtained by comparing the size of the horse fauna in the Karmawibhangga Relief with the size of actual horses. The relief horses were

measured using *Image Meter-Photo Measurement* software, while the actual horses were measured directly in Mangkujo (Magelang Kuda & Joglo) using a measuring tape. The actual horse used for comparison was a Sandalwood Horse, which is similar to all *light horses* that are predominantly used for riding and horse racing (Figure 3). This horse was a 5-year-old female weighing approximately 300 kg. The body parts compared were height, head, neck, limbs, feet, and tail. Furthermore, the length of each body part was expressed in terms of relief ratio and actual ratio. The results of the differences in body part proportions between the relief horse and the actual horse are shown in Table 6.



Figure 3. Sandalwood Horse (*Equus caballus*)

Table 6. Comparison of the proportions of the horse's body parts in the Karmawibhanga Relief with the actual proportions of the horse's body parts, referring to Arjun et al. (2025).

Body Part	Length (cm)		Body Measurement Part	Total Length (cm)		Ratio	
	Relief	Actual		Relief	Actual	Relief	Actual
Height	32.5	162	Height : body length	56.7	317	1 : 1.7	1 : 1.9
Head	14.2	54	Head : neck	21.7	109	1 : 1.5	1 : 2.01
Neck	7.5	55	Neck : shoulder	17.1	120	1 : 2.3	1 : 2.1
Leg	8	48	Limb : thigh	21	103	1 : 2.6	1 : 2.1
Foot	21.5	103	Front leg :	44.5	209	1 : 2.1	1 : 2.02
			Rear leg				
Tail	13	38	Tail : leg	21 cm	86	1 : 1.6	1 : 2.2

Based on Table 6, a comparison of the proportions of the horse's body parts shows that the body parts depicted in the relief tend to have smaller ratios compared to the actual size of a horse. The existence of scale variations in several parts indicates that the artist made artistic adjustments in the relief. The ratio data from Table 6 was converted into percentages to find the percentage difference between the relief horse and the real horse. Next, to determine the accuracy of the visualization of the horse fauna in the relief that represents the actual anatomical proportions by calculating the percentage similarity of body parts between the relief horse and the actual horse using a formula adapted from Dasore et al. (2022). The results of the calculation of the percentage of similarity are presented in Table 7.

Percentage of similarity = 100% - (the difference between the proportions of the relief horse and the actual horse).

Table 7. Percentage similarity of body part proportions, with reference to Ravindran (2025).

Body part	Formula (%)	Percentage of Similarity (%)
Height	(100 - 6)	94
Head	(100 - 17)	83
Neck	(100 - 4)	96
Leg	(100 - 9)	91
Foot	(100 - 2)	98
Tail	(100 - 17)	83
Average		90.83

Based on Table 7, the proportions of the horses depicted in the reliefs demonstrate a high level of similarity to actual horses, with an average similarity rate of 90.83%. Each body part shows very small differences, with the size of the foot having the highest similarity (98%) and the size of the tail and head having the lowest similarity (83%). This finding indicates that the sculptors carefully preserved the anatomical characteristics of horses in the relief representations. Minor differences in proportions likely result from technical adjustments or stylistic stylization by the sculptors to maintain visual harmony without losing primary biological characteristics. Consequently, the 90.83% similarity rate places the depiction of horses in these reliefs in the "High" similarity category compared to actual horses.

Ethnozoological Analysis

In general, the narrative context in a relief at Borobudur Temple is based on ancient manuscripts about a particular teaching or on conditions during a particular period. The Karmawibhangga relief at Borobudur Temple depicts conditions during the Ancient Mataram period (Damai, 2020). According to previous research conducted by Santiko and Nugrahani (2012) and Munandar's (2016) writing in the book *100 Years After the Post- on of the Restoration of Borobudur Temple*, this relief is an adaptation of a literary work that was later modified to reflect the conditions during the Ancient Mataram period. According to archaeologists, the scenes in the Karmawibhangga Relief refer to the *Mahakarmawibhangga* manuscript from India, which contains 80 types of karma, but the sculptors (*silpin*) visualized around 40 scenes that were adapted to the natural and socio-cultural environment of Ancient Java. The artists used carving objects in accordance with the natural, social, and cultural conditions (Setiawan, 2020). This is in line with the findings of Febrianto and Idris (2016), who explain that the fauna reliefs at Borobudur are valid archaeozoological data for reconstructing the biodiversity of the past.

The representation of horses (*Equus caballus*) indicates intensive interaction between humans and animals at that time. The presence of horses in the Karmawibhangga Relief is not merely artistic imagination, but a reflection of the ecological and sociological reality of Ancient Mataram society. The existence of various types of animals carved on the

temple walls implicitly shows that animals were used for various human purposes before the 7th century AD, for example, types of domesticated animals such as buffalo, geese, horses, and pigeons (Idris & Sepriady, 2017).

Morphometric Analysis of Horses

Zoologically, horses (*Equus caballus*) are hoofed animals of the genus *Equus* that have been domesticated since prehistoric times and used by humans for their abilities. In a study conducted by Prihandini and Umami (2021), it is explained that horses (*Equus caballus*) are mammals that can be classified into several types based on size, body shape, and use. Light horses, such as racehorses, with a height of about 1.45-1.7 m when standing, are used as riding horses for equestrian sports. Meanwhile, heavy horses have almost the same height but are heavier and are usually used as workers and means of transportation. Ponies are less than 1.45 m tall and weigh less. Horses tend to have a stocky body structure, a long, slender tail, and strong hooves (Zannah et al., 2022).

The horse in the Karmawibhangga relief shows morphological details as seen from its posture, which is clearly visible in Table 5, panel 93. In Table 7, the results of morphometric analysis with a similarity level of 90.83% prove that sculptors at that time not only used their artistic imagination but also had a deep understanding of the physical features and characteristics of the animals they visualized (Wulandari, 2022). This proves that Borobudur artists applied the *Sad-angga* principle in their work. As described by Istanto (2018) and Yustana (2011), the visualization of temple reliefs is bound by the *Sad-angga* rules, which consist of: (1) *Rupabheda*, namely the differences in form that embody horses with their characteristics; (2) *Sadrasya*, which is the embodiment of temple ornaments that are similar to what is seen, so that they display the form of horses as they are in nature; (3) *Pramana*, which is the precise proportions and size of each part of the horse's body; (4) *Varnikabhanggam*, which involves tools, colors, and materials; (5) *Bhava*, which is the artist's feelings poured into a work of art, such as the natural gestures of a horse when turning its head and licking its body (*auto-grooming*); (6) *Lavanya yojanam*, which is a work of art that contains beauty and appeal. Thus, this relief is a combination of biological knowledge and artistic aesthetics. The aim is to maintain the harmony of the artistic composition and adapt to the technical limitations of stone as a medium, without reducing the clarity of the visual symbols that are intended to be conveyed (Wahyudi et al., 2025).

The Symbolism of the Horse (*Equus caballus*) in the Karmawibhangga Relief

The appearance of horses in the relief is positioned as a supporting element that represents the dualism of contradictory meanings in Buddhist theory on cause and effect (*the Law of Karma*) of human actions, namely karma for good deeds and punishment for bad deeds. As can be seen in Table 5, the visualization of panel number 93 is thought to depict people gossiping (A), the consequences of which are related to the elements next to them, namely a flock of birds. In the middle left, there is a person beating another person with a stick (B), and the consequences are related to the elements next to it, namely a group of four-legged animals such as deer, cows, and horses. Based on the narrative context

described by Santiko & Nugrahani (2012) in the book *Adegan dan Ajaran Hukum Karma pada Relief Karmawibhangga* (Scenes and Teachings of Karma in Karmawibhangga Reliefs), the presence of horses here is as "incarnations". Thus, it is assumed that humans who commit medium-level sins, such as speaking wrongly (A), will be reborn as birds, while humans who commit violence, such as beating others (B), will be reborn as four-legged animals, one of which is a horse (K). This is in line with Anandajoti Bhikkhu's (2020) interpretation in the book *Karmavibhanga: The Law of Kamma* that this scene depicts the consequences of "living wrongly through speech or body" which leads to rebirth in the animal realm. Thus, the horse in this panel is a depiction of the result of bad deeds (*akusala karma*). The horse represents the animal realm (*Tiryagyoni*), which is a degradation in which human consciousness declines to animal instincts due to the loss of morality. In this context, the horse becomes a symbol of bondage, in which the creature must submit to natural instincts and the domination of other humans.

Visualization panel number 129 (Table 5) is thought to symbolize greatness, as shown by the presence of a man sitting between two women (C) in a position higher than the people around him below (D.1, D.2), making him appear to be in control. Based on the narrative context described by Santiko & Nugrahani (2012), this scene represents a figure on a bench accompanied by a princess and a servant, with the inscription "*Cakravartī*," which means king of the universe. The presence of a horse (K) along with an elephant, jewels, and a wheel on the right side (D.2) is a symbol of the Seven Jewels (*Saptaratna*) belonging to a King of the Universe (*Cakravartī*) (Anandajoti Bhikkhu, 2020). Thus, the horse here is called the Jeweled Horse (*Ashva-ratna*). Its existence represents the result of good deeds (*kusala karma*), namely glory and worldly wealth obtained without greed. Thus, the horse symbolism reflects the hierarchical social structure of Ancient Javanese society and represents authority, prestige, and prosperity within Buddhist cosmological values with the presence of royal attributes such as elephants, umbrellas, and guards. The protruding tongue (licking the body) can be interpreted as a symbol of prosperity and well-being. Natural behavior (*auto-grooming*) is only performed by animals that feel safe, calm, and free from threat (McGreevy et al., 2018). According to zoology experts, horses have instinctive sensitivity that enables them to form emotional bonds with humans, which can even be beneficial for mental and physical health therapy. In this case, panel 129 shows that a person with good morals can create inner harmony between humans, horses, and their environment.

The Permata horse can run as fast as the wind and carry its king around the world to uphold justice without violence. This is in line with the findings of Febrianto and Idris (2016), who stated that the fauna at Borobudur often visualizes social status. Horses here provide protection or serve as vehicles. This is reinforced by archaeologists who mention the term "*Jaran Teji*" which refers to high-quality riding horses synonymous with nobility or knights. The relationship between humans and horses can be seen from the use of horses as transportation to carry goods and people for thousands of years (Zannah et al., 2022).

Visualization of panel number 132 (Table 5) is thought to symbolize greatness like the previous panel because there is a king sitting between three women (E) and other elements such as guards sitting below (F.1, F.2) and the presence of a jeweled elephant and

jeweled horse (K) on the right side (F.2) as symbols of the Seven Jewels (*Saptaratna*) belonging to a Universal King (*Cakravartī*). Based on the narrative context described by Santiko & Nugrahani (2012), this scene contains an inscription of *Cakravartī*, a ruler sitting on a throne flanked by guards, where horses and elephants are interpreted as attributes of power. The king is seated with three concubines on the platform and a female jewel standing on the left center (Anandajoti Bhikku, 2020). Thus, the horse is a depiction of good deeds (*kusala karma*), which represent the fruits of karma from self-control. The figure of the king surrounded by *Saptaratna* is a manifestation of a leader who has great "moral power," so that the universe supports his power through the presence of noble animals, one of which is the horse. Thus, horses are considered to symbolize social status and power, as well as strength because they are the king's means of transportation to go anywhere quickly.

The visualization in panel number 150 (Table 5) suggests a strong interaction between humans and horses when viewed on the left side (H), which depicts a horse (K) as the mount of a king sitting on it, with guards below. Then, on the right side (G), there are several people giving something to a respected person. Thus, it can be assumed that good deeds such as giving to respected people will result in good rewards such as power or possession of one of the Seven Gems, such as horses and elephants, which are visible for ease of mobility. Based on the narrative context described by Santiko & Nugrahani (2012), the scene shows four people making offerings to a priest, while, a king, sits on a palanquin. This is reinforced by the inscription of sandals (*upānaṭ*) and sufficient vehicles (*vāhanāvaikalya*), meaning that the good deed of giving sandals to a respected sage will result in sufficient vehicles in the next life through the visualization of horses and elephants (Anandajoti Bhikkhu, 2020). Thus, the horse in this panel is the result of good deeds that symbolize loyalty and peace. Generosity in helping others' mobility by giving sandals will result in comfortable transportation and ease of travel in the next life. Zannah et al. (2022) emphasize that the interaction between humans and horses has historically been based on mutualism.

Visualization of panel number 159 (Table 5) shows a man wearing royal attire sitting between three women in the center of the panel (I), accompanied by a horse (K) and an elephant, which are two of the seven jewels (*Saptaratna*). Therefore, it can be assumed that this panel depicts a story from the *Cakravartī* theme with the presence of the Jeweled Horse (K), which symbolizes the greatness of a Universal King. Based on the narrative context, as explained by Santiko & Nugrahani (2012), this scene depicts a man dressed in royal attire sitting between three women. A king who is able to provide protection receives good karma (Anandajoti Bhikkhu, 2020). Thus, the horse here is the result of good deeds that symbolize glory, loyalty, and luxury by representing the noble status of the main character in providing protection (shelter) to his people.

As time progressed, the role of horses continued to evolve. According to zoology sources, besides being used for mobility and warfare, horses are also used in sports and therapy. Horses have strong feelings or instincts. This is in line with the findings of Scopa et al. (2019), which prove the transmission of emotions between horses and humans, where horses can provide physiological responses to their handlers and riders.

Relevance to Character Education Values

Based on the analysis of the symbolism of horses (*Equus caballus*) in the narrative context of each panel, relevance to character education values was found. The indicators of character education values used refer to Ambarwati (2023) in the book *Introduction to Understanding 18 Character Education Values*, which include: 1) religious, 2) honest, 3) tolerant, 4) disciplined, 5) hardworking, 6) creative, 7) independent, 8) democratic, 9) curiosity, 10) national spirit, 11) love for the homeland, 12) appreciation of achievement, 13) friendliness, 14) love of peace, 15) love of reading, 16) care for the environment, 17) social care, and 18) responsibility. In the Karmawibhangga Relief, horses are present as a manifestation of human character. The presence of horses serves as a supporting element for the main characters, showing the close relationship between humans and animals, which implicitly becomes a medium for conveying moral messages. Specifically, these character values are manifested in the narrative of each panel as follows:

- 1) In panel 93, the character values contained are religious and responsibility. This relates to an awareness of moral consequences that teaches humans to always think before acting and to avoid bad behavior that harms themselves and other creatures.
- 2) In panels 129 and 132, the character values contained are love of peace and care for the environment. This relates to the harmony between humans, animals, and their environment, which shows that leaders or individuals with good character can create a peaceful life.
- 3) In panel 150, the character values contained are generosity and social awareness. This relates to the nature of generosity in humans, which produces good deeds and conveniences in life, such as transportation facilities in the form of horses. This value emphasizes the attitude of helping others in need as a moral investment.
- 4) In panel 159, the character values contained are responsibility and social awareness. This relates to the leadership trait of courage to protect the people and the environment. Thus, it produces the fruit of goodness in the form of a gem horse.

The symbolism of the horse in the Karmawibhangga Relief reflects the six values of character education it embodies. This serves as empirical evidence that, since the era of Ancient Java, these works have implicitly conveyed moral messages regarding ethics and the relationship between human character and the environment and life. Here lies the primary relevance of character education values to ethnozoological studies in this research. The horse is positioned as a biological object that reflects societal morality. This serves as a relevant mirror in the formation of human character. The contained symbolism can reinforce ecological conservation values and foster a generation that is socially and culturally sensitive. Essentially, the preservation of local wisdom and culture undoubtedly provides educational value and knowledge for future generations (Iswatiningsih, 2019). The character education values embedded in the symbolism of the horse in the Karmawibhangga Relief hold potential in education to build a generation that is intelligent and fosters good character through the learning process (Saputro, 2024).

Therefore, these ethnozoological findings have the potential to be integrated into formal education. They are particularly relevant for integration into the high school biology

curriculum, such as in the core topic of Biodiversity or the Animal Classification (Vertebrates) module in Phase E. Through methods such as case studies or visual literacy reading materials in the classroom, students can discuss how the symbolism of the horse in the Karmawibhangga reliefs fosters character values. Thus, the novelty of this manuscript lies in offering a framework that bridges modern biology with local wisdom. This approach aligns with the Merdeka Curriculum as a source of contextual biological literacy supporting the Pancasila Student Profile Strengthening Project (P5) under the theme of Local Wisdom. Consequently, this strategy is expected to help build students' core moral character while fostering a deep appreciation for the preservation of cultural heritage.

CONCLUSION

Based on the results of ethnozoological analysis, it can be concluded that the representation of horses (*Equus caballus*) scattered in panels number 93, 129, 132, 150, and 159 on the Karmawibhangga Relief is a form of integration between biological knowledge and cultural values of Ancient Javanese society. The presence of horses in the five panels does not only function as a decorative element, but also contains a deep symbolic meaning related to the law of cause and effect (the Law of Karma) as a real manifestation of human moral qualities that strengthen cultural identity and environmental ethics. Horses symbolize bondage, social status, glory, strength, power, loyalty, peace, fidelity, and luxury. In terms of its relevance to character education, the presence of horses serves as a supporting element that reinforces the moral message of the main character. The interaction between humans, horses, and the environment in the narrative reflects 6 of the 18 character education values, namely religious, responsibility, social care, generosity, love of peace, and care for the environment. The limitation of this research lies in its focus, which is restricted to the symbolic analysis of a single faunal taxon the horse within the reliefs and its relevance to character values, without involving the development of instructional products or field implementation. This research can serve as a source of contextual biological literacy and inspiration for educators to support the field of education.

REFERENCES

- Achmadi, A. S., Maryanto, I., Rusdianto, M., & Dwijayanti, E. (2020). Identifikasi singkapan simbolik fauna mamalia pada babak cerita di relief Lalitavistara Candi Borobudur (Identification of the symbolic carvings of mammal species in the story of Lalitavistara relief of Borobudur Temple). *Jurnal Biologi Indonesia*, 16(2), 111–141.
- Ambarwati, A. (2023). *Pengantar memahami 18 nilai pendidikan karakter*. Pustaka Pelajar.
- Anandajoti Bhikkhu. (2020). *Karmavibhanga: The law of kamma*. The Ancient Buddhist Texts. <https://www.ancient-buddhist-texts.net/>
- Andina, S. A., & Aliyah, I. (2021). Faktor-faktor yang mempengaruhi minat wisatawan dalam mengunjungi wisata budaya Candi Borobudur. *Cakra Wisata*, 22(1).
- Anggorojati, A., Widayat, R., & Budi, S. (2023). Visualization of paddy in Panel 65 of the Karmawibhangga section of Borobudur Temple. *Biodiversitas Journal of Biological Diversity*, 24(2).

- Ardiyansyah, P., Permana, D. I., Aristina, M., & Setiyawan, I. (2020). Interpretasi relief Gandawyuha di Candi Borobudur: (Studi kasus relief Gandawyuha dinding lorong II). *Jurnal Konservasi Cagar Budaya*, 14(2), 16–41.
- Arjun, B. S., Ravinagarajan, J., Pachiyappan, S., & Thomas, B. (2025). Mengungkap akar naskah dan budaya India Kuno sebagai pilar untuk praktik lingkungan, sosial, dan tata kelola (ESG) dalam keberlanjutan korporat. Dalam *Manajemen Bisnis dan Etika* (hlm. 47-68). Emerald Publishing Limited.
- Cahyawati, R. (2023). *Analisis strategi dalam mengoptimalkan digitalisasi pada pembiayaan: Studi kasus di KSPPS Baitul Maal Wa Tamwil Dana Ukhuwah cabang Cicalengka Kabupaten Bandung* [Doctoral dissertation, Universitas Koperasi Indonesia].
- Creswell, J. W. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage Publications.
- Damai, H. (2020). Komunikasi visual dalam relief Karmawibhangga Candi Borobudur. *Jurnal Panalungtik*, 3(2), 105-116.
- Dasore, A., Rajak, U., Panchal, M., Reddy, V. N., Verma, T. N., & Chaurasiya, P. K. (2022). Prediksi karakteristik keseluruhan mesin CI dual fuel yang beroperasi pada campuran etanol dan diesel berdensitas rendah pada rasio kompresi yang bervariasi. *Arabian Journal for Science and Engineering*, 47(12), 15323-15330. <https://doi.org/10.1007/s13369-022-06625-8>
- Efendi, F. (2026). *Perawatan kuda pacu*. Fahmi Karya.
- Febrianto, R., & Idris, M. (2016). Kisah relief fauna pada Candi Borobudur. *Kalpataru: Jurnal Sejarah dan Pembelajaran Sejarah*, 2(2), 44-56.
- Gaina, C. D. (2023). *Manajemen kesehatan kuda wilayah semi ringkai Kepulauan Sumba*. Penerbit NEM.
- Idris, M., & Sepriady, J. (2017). *Mutiara Borobudur: Tafsir bodhi citta, kajian sejarah dan ikonografi*. Excellent Publishing.
- Istanto, R. (2018). Estetika Hindu pada perwujudan ornamen candi di Jawa. *Imajinasi: Jurnal Seni*, 12(1), 1-10.
- Iswatiningsih, D. (2019). Penguatan pendidikan karakter berbasis nilai-nilai kearifan lokal di sekolah. *Satwika: Kajian Ilmu Budaya Dan Perubahan Sosial*, 3(2), 155-164.
- Kemdikbudristek. (2022). *Panduan penguatan profil pelajar Pancasila dalam Kurikulum Merdeka*. Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi.
- Lickona, T. (2018). *Pendidikan karakter: Panduan lengkap mendidik siswa menjadi pintar dan baik*. Bumi Aksara.
- McGreevy, P., Christensen, J. W., von Borstel, U. K., & McLean, A. (2018). *Equitation science* (2nd ed.). Wiley-Blackwell.
- Metusala, D., Fauziah, Lestari, D. A., Damaiyani, J., Mas'udah, S., & Setyawan, H. (2020). The identification of plant reliefs in the lalitavistara story of Borobudur temple, central Java, Indonesia. *Biodiversitas*, 21(5), 2206–2215. <https://doi.org/10.13057/biodiv/d21>

- Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd ed.). SAGE Publications.
- Munandar, A. A. (2016). Adegan-adegan relief Mahakarmmavibhangga Candi Borobudur: Tinjauan terhadap penataan tataran adegan dan makna simboliknya. Dalam H. Santiko (Ed.), *100 tahun pascapemugaran Candi Borobudur: Trilogi I menyelamatkan kembali Borobudur* (hlm. 65–79). Balai Konservasi Borobudur.
- Nurfalah, Y. (2016). Urgensi nilai-nilai pendidikan karakter. *Tribakti: Jurnal Pemikiran Keislaman*, 27(1), 170–187.
- Prihandini, A., & Umami, M. (2021). Studi etnozoologi sejarah penggunaan patung kuda (*Equus caballus*) sebagai ikon Kota Kuningan, Jawa Barat. *Borneo Journal of Biology Education (BJBE)*, 3(2), 67-78.
- Putri, A. F., Sukmono, T., & Nugraha, A. P. (2025). Ethnozoological study of Malay tribal communities in Mersam village, Batanghari district. *Jurnal Biologi Tropis*, 25(2), 1329-1341.
- Ravindran, P. N. (2025). *Tanaman ikonik India: Volume 2*. Notion Press.
- Samvara, M. A. (2023). *Rekonstruksi regulasi pemanfaatan Candi Borobudur untuk peribadatan umat Buddha berbasis nilai keadilan* [Doctoral dissertation, Universitas Islam Sultan Agung].
- Santiko, H., & Nugrahani, D. S. (2012). *Adegan dan ajaran hukum karma pada relief Karmawibhangga*. Balai Konservasi Borobudur.
- Saputro, V. G. (2024). Nilai-nilai pendidikan karakter dalam relief Karmawibhangga di Candi Borobudur. *Jurnal Riset dan Inovasi Pembelajaran*, 4(1), 665–673.
- Sari, I. P. (2018). *Keragaan reproduksi dan morfologi pada kuda jantan (Equus caballus) di Kabupaten Deli Serdang* [Doctoral dissertation, Universitas Sumatera Utara].
- Sari, M. P., Wijaya, A. K., Hidayatullah, B., Sirodj, R. A., & Afgani, M. W. (2023). Penggunaan metode etnografi dalam penelitian sosial. *Jurnal Pendidikan Sains Dan Komputer*, 3(1), 84–90.
- Scopa, C., Contalbrigo, L., Greco, A., Lanatà, A., Scilingo, E. P., & Baragli, P. (2019). Emotional transfer from human to horse: Cardiac responses and movement asymmetries. *Physiology & Behavior*, 209, 112603.
- Setiawan, D. (2020). Simbolisme relief Karmawibhangga dalam perspektif edukasi moral. *Jurnal Kajian Budaya dan Pendidikan*, 8(1), 45–58.
- Syahputra, M. C. (2020). Nilai-nilai pendidikan karakter dalam budaya nengah nyappur. *Jurnal PAI Raden Fatah*, 2(1), 1-10.
- Utami, R. N. F., Muhtadi, D., Ratnaningsih, N., Sukirwan, S., & Hamid, H. (2020). Etnomatematika: Eksplorasi Candi Borobudur. *JP3M (Jurnal Penelitian Pendidikan dan Pengajaran Matematika)*, 6(1), 13–26.
- Wahyudi, D. Y., Jati, S. S. P., Wijaya, D. N., Laili, V. S. A., Ananda, L. S., & Ikhrom, A. M. (2025). Relief Aridharma: Komunikasi keagamaan masyarakat Jawa Timur pada abad ke-13 Masehi. Dalam *Konferensi Internasional ke-5 tentang Humaniora dan Ilmu Sosial (ICHSS 2024)* (hlm. 200–211). Atlantis Press.

- Wibisono, H. W., Wandia, I. N., & Suatha, I. K. (2017). Morfometri kuda (*Equus caballus*) jantan dewasa yang dipelihara di Kabupaten Lombok Timur, Nusa Tenggara Barat. *Jurnal Indonesia Medicus Veterinus*, 6(1), 55–61.
- Wulandani, W., et al. (2021). Penguatan pendidikan karakter berbasis kearifan lokal di sekolah dasar. *Jurnal Pendidikan Karakter*, 11(2), 210–221.
- Wulandari, A. (2022). *Batik Nusantara: Makna filosofis, cara membuat, dan industri batik*. Andi Publisher.
- Yustana, P. (2011). Gajah dalam terakota Majapahit. *Ornamen*, 8(1).
- Zannah, R., Pangestua, H. K., & Umami, M. (2022). Peran penting kuda (*Equus ferus caballus*) di Kabupaten Kuningan, Jawa Barat. *Borneo Journal of Biology Education (BJBE)*, 4(2), 108–115.