

DESIGNING 2D ANIMATION ILLUSTRATION ASSETS TO RAISE ENVIRONMENTAL AWARENESS IN THE WONOREJO MANGROVE FOREST

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ABSTRACT

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The Wonorejo Mangrove Forest is currently facing environmental pollution caused by plastic waste, which threatens the balance of its ecosystem. One of the main contributing factors is the lack of environmental awareness, especially among children. This study aims to design 2D animation illustration assets as an educational medium to raise environmental awareness from an early age. The research uses a qualitative approach, with data collected through interviews, observations, internet sources, and documentation. The design concept includes storyline development, themes, characters, and storyboards to support engaging and innovative educational animation. Supporting media such as posters, stickers, pins, and keychains are also included. The results of this design are expected to serve as an effective educational tool to encourage the preservation of the Mangrove Forest.

Keywords: Illustration; 2D Animation; Environmental Awareness; Mangrove Forest;

1. INTRODUCTION

Mangrove forests, also known as mangrove swamps, are a type of forest that develops in coastal areas and typically grows in regions submerged in salty or brackish water. These forests consist of mangrove trees equipped with specialized roots that allow them to survive in waterlogged environments. Mangrove forests play a crucial role in maintaining the balance of coastal ecosystems. They also serve as recreational and tourist destinations where visitors can learn about the beauty and diversity of mangrove ecosystems.

However, one of the major challenges faced by mangrove forests is waste pollution, especially plastic waste that contaminates these areas. Some of the impacts of marine debris on mangrove ecosystems include a decrease in available oxygen for the mangroves and the possibility of the plants experiencing stress or even death. If these issues are ignored, they can negatively affect aquatic organisms that live within the mangrove ecosystem (Kusumo, 2021).

The high abundance of plastic waste has made the Wonorejo Mangrove Forest one of the most polluted areas. The main contributing factor is the strong current that flows

through the mangrove region, especially in the estuary area. Marine debris in estuarine mangrove areas tends to spread more easily and be displaced due to tidal influences.

The abundance of waste in mangrove ecosystems is also influenced by litter originating from residents' activities along the river. This includes behaviors such as throwing garbage into the river, fishing, disposing of household waste, and trading activities (Nurdiana & Trivantara, 2021). Throwing trash into the river has become a common practice due to a lack of awareness about the importance of environmental cleanliness. Many people still do not realize that waste from rivers eventually ends up in the ocean, threatening the mangrove ecosystem.

To raise public awareness about the importance of maintaining cleanliness, several steps can be taken—such as improving environmental education, especially for children, so they can understand the negative impacts of waste on mangrove ecosystems. Children often contribute to the problem due to a lack of understanding about the consequences of littering and how to manage waste properly. So far, waste management education has only been delivered through printed materials and directly by teachers. Children's behavior can be influenced by environments that do not model proper waste management. Since childhood is a stage where children imitate much of what they see, including characters from educational animations (Arsita, 2014), role models are essential.

Using characters in animation makes the learning process more effective and helps children absorb information thoroughly and deeply (Dahlan, 2021). Choosing characters that are cute and relatable to the target audience can increase children's interest in learning about waste management and reduce boredom. Therefore, the main focus of this design is children aged 10 to 15 years, as they are in a critical stage of cognitive and social development. Children at this age are already able to understand cause-and-effect relationships, but they are still highly influenced by visuals and compelling stories. Their strong interest in fictional characters in media such as animations makes an educational approach through visual characters a highly effective method for instilling positive habits.

In addition, **2D animation** is chosen as the medium because it effectively conveys messages visually and narratively in an engaging and easy-to-understand way. The simple, expressive, and colorful visual style of 2D animation is considered effective in capturing children's attention and simplifying complex environmental concepts that might be difficult to explain verbally. Compared to conventional educational methods, 2D animation can build a stronger emotional connection between the audience and the characters, allowing educational values to be received naturally through the stories presented.

Based on the aforementioned background, this design project aims to create a set of illustration assets to support a 2D animation that raises public awareness about the waste issue in the Wonorejo Mangrove Forest. With well-designed illustration assets, it is hoped that both young and old members of the community will be more motivated to actively participate in preserving the sustainability of the mangrove forest. This is especially important in addressing the waste problem in the Wonorejo Mangrove Forest.

2. THEORETICAL FRAMEWORK

Mangrove Forests in Surabaya

A mangrove forest is a group of trees that grow along tropical coastlines. These trees can survive in areas affected by tides and muddy environments. Mangrove forests are typically found in places such as beaches, shallow bays, river estuaries, deltas, and sheltered coastal areas. These forests are extremely important because they protect coastlines from

erosion, provide habitats for many animals, and help filter pollutants from the water (Gunarto, 2004).

Illustration

An illustration is a visual image used to explain various things such as events, characters, writings, or specific purposes. Illustrations can attract readers' attention and help them better understand written content. In addition, illustrations serve as a way to express ideas or thoughts and to briefly convey the essence of the text. As a visual communication medium, illustrations can provide entertainment and clarify concepts more effectively through images.

The purpose of using illustrations is to make message delivery easier and more understandable. Moreover, illustrations add variety to learning materials, making them more engaging, motivating, communicative, and helpful in facilitating comprehension. According to Arifin and Kusrianto (2009:70), illustrations also help readers remember the ideas or concepts being presented.

2D Animation

In general, animation is a sequence of different images shown alternately to create the illusion of movement and change. Animation consists of rapidly moving images that gradually change in each part of an object, thus generating the illusion of motion. The quick progression of each image frame allows the human eye to perceive a smooth motion rather than individual images (Sugihartono, 2010).

In animation, motion is a fundamental aspect studied as a basic art form to make characters appear alive and realistic. Motion is closely related to timing, which is a critical element in animation (Maestri & Adindha, 2006).

Color

The importance of color and coloring techniques in digital illustration cannot be underestimated, as both play a crucial role in bringing life, mood, and visual appeal to digital artworks. Color functions not only as a decorative element but also as a communication tool that can convey emotions, set the atmosphere, or direct the viewer's attention. Choosing the right color palette can enhance the clarity of the message intended by the illustration. Coloring involves various techniques such as shading, highlighting, and color gradients to create depth, texture, detail, and visual harmony in the illustration.

Color harmony refers to the creation of aesthetically pleasing and balanced color combinations within a design. It involves selecting and arranging colors in a way that creates a cohesive and visually appealing look (Yusa et al., 2023), giving a realistic and immersive impression to the illustration.

Color has a significant ability to influence human feelings and emotions. It not only has a strong psychological impact but can also reflect a person's mood. In illustration, color is often used to convey messages, set the tone, determine the mood, and incorporate a variety of emotions contained in the artwork (Darmaprawira, 2002).

Previous Research

The first relevant study is a research report by Rahmanda, A. F., & Rijal, S. S. (2024) titled *"Map of Marine Debris Abundance in the Mangrove Ecosystem of Wonorejo, Surabaya City, East Java"*, which illustrates the negative impacts of marine debris accumulation, including disruption of mangrove growth, root respiration hindrance, and impaired photosynthesis in mangrove seedlings. Another related study was conducted by

Rohmandita, D., & Munib, J. A. (2022), titled *"Character Design as Support for Children's Educational Animation on 4R Waste Management"*, discussing how to design characters that support educational animations about 4R waste management (Reduce, Reuse, Recycle, Replace). Additionally, there is a research report by Iqlima et al. (2023) titled *"Designing an Illustration Book on Marine Life Affected by Plastic Waste"*, which explores the design of an illustrated book aimed at educating children about marine life impacted by plastic pollution

3. METHOD

This study employs a qualitative method based on the design of 2D animation illustration assets, with the aim of raising public awareness—especially among children—about the importance of preserving mangrove forest ecosystems. The chosen location for data collection is the Wonorejo Mangrove Forest, located at Jl. Wonorejo Timur No.1, Wonorejo, Rungkut District, Surabaya, East Java 60296. Like other mangrove forests, the Wonorejo area offers rich biodiversity and unique ecosystems that can be observed and studied. This location is highly suitable as an educational platform for learning about mangrove and coastal ecosystems. The target audience of this research includes elementary school students (Grade 5) to junior high school students, aiming to cultivate environmental awareness at a young age.

Data were collected through interviews, observation, documentation, and internet research. Primary data such as interviews were conducted with Mr. David, the field coordinator of the Wonorejo Mangrove Ecotourism in Surabaya. The purpose of this interview was to gather information regarding the management of the mangrove area, its benefits, and the challenges faced in the field. In addition, on-site observations and interactions with staff and visitors revealed that the area is well-managed. Visitors have access to a wooden tracking path that stretches through the mangrove forest, accompanied by informational boards explaining various mangrove tree species, their environmental benefits, and the types of fauna living within the ecosystem. There are also supporting facilities such as gazebos, benches, public restrooms, and trash bins placed at various points around the site. Secondary data included documentation of the tracking paths, boat docks for ecotourism, and other infrastructure that allows visitors to directly experience the ecological value and beauty of the mangrove forest. Internet sources were also utilized to gather supporting information from online references, journals, articles, and relevant regulations.

Once the data were collected, data analysis was conducted to identify the core issues in detail. In the design of 2D animation illustration assets to promote environmental awareness in the Wonorejo Mangrove Forest, the 5W + 1H analysis method was used (What, Who, Where, When, Why, and How) to understand the problems thoroughly and find suitable solutions. Based on the results of this analysis, the initial step in the illustration asset design process was to create characters using a friendly illustration style—featuring bright colors, chibi-style characters, and expressive facial expressions to support emotional storytelling. The next stage was the creation of a storyline, aimed at building a structured and engaging narrative so that the intended message could be easily understood by the audience, especially children and teenagers. Once the storyline was finalized, a storyboard was developed based on the narrative structure. The final step in the design process was the coloring phase, which served as the concluding part of creating the 2D animation illustration assets.

4. RESULTS AND DISCUSSION

Based on the results of interviews and observations, it was found that the Wonorejo Mangrove Ecotourism site has great potential as a natural and engaging platform for environmental education. However, it still faces several challenges, such as the lack of educational media, issues with waste management, and limited community participation in maintaining the cleanliness of the area. Although the available facilities are quite adequate and educational activities are held regularly, the methods of delivering information remain conventional and are less engaging for children. Therefore, there is a strong need for more creative and communicative educational media, particularly in the form of visually appealing materials that can effectively convey messages about environmental preservation from an early age.

The development of the concept and creative ideas began with the identification of key environmental issues, with a primary focus on the importance of protecting mangrove forests from waste pollution. Mangroves were chosen as the central theme due to their crucial role in maintaining coastal ecosystem balance, yet many people still do not fully understand the importance of preserving this habitat. To communicate this message effectively, an educational narrative approach was chosen—packaged as a light adventure story featuring a child and animal characters as the main protagonists. This approach is intended to make the message more accessible and relatable for children and teenagers, who are the primary target audience.

The visual design style used in the illustration asset development adopts a semi-flat design approach—a visual style that combines the simplicity of flat design with added elements such as soft shadows, light color gradients, and subtle visual depth. This approach was selected because it provides a modern and clean look, while still offering an engaging and visually rich experience.

The typography used in this project includes Nok and Renogare fonts, both of which fall under the sans-serif category. These fonts were chosen for their readability and contemporary appearance. As for color choices, a wide range of vibrant and cheerful colors was applied, tailored to the preferences of the child audience. Additionally, natural tones were incorporated to reflect the environment of the mangrove forest itself.



Figure 1. Product Design Typography
(Source: Google)



Figure 2. Color Palette
(Source: Author's personal document)

The main media used in this design project are illustration assets for 2D animation and a Guidelines Book, which serves as a reference manual for applying the illustration style, color usage, character design, typography, and other graphic elements.

a. Character Design

The character **Nilo**, a cheerful and curious young girl, was created as a representation of environmentally conscious children.



Figure 3. Character Nilo
(Source: Author's personal document)

She is accompanied by **Toto**, a friendly turtle who loyally follows Nilo wherever she goes. Toto is thoughtful and always cautious in everything he does.



Figure 4. Character Toto
(Source: Author's personal document)

b. Application of Character Design in 2D Animation

In an effort to raise environmental awareness in the Wonorejo mangrove forest, the characters Nilo and Toto were created as educational media supported by 2D animation to bring the characters to life. The first video is titled *"What is a Mangrove Forest?"*. This video focuses on introducing mangrove forests in general, including unique facts and their functions for coastal ecosystems. The story begins with Toto's curiosity about coastal ecosystems, which differ from regular forests. Nilo then invites Toto to explore the mangrove

area, explaining the different types of mangrove plants, the role of their roots in preventing coastal abrasion, as well as the animals that inhabit them. The narrative is presented in a light, interactive dialogue style, interspersed with Toto's expressions of amazement, which reflect the audience's sense of wonder.

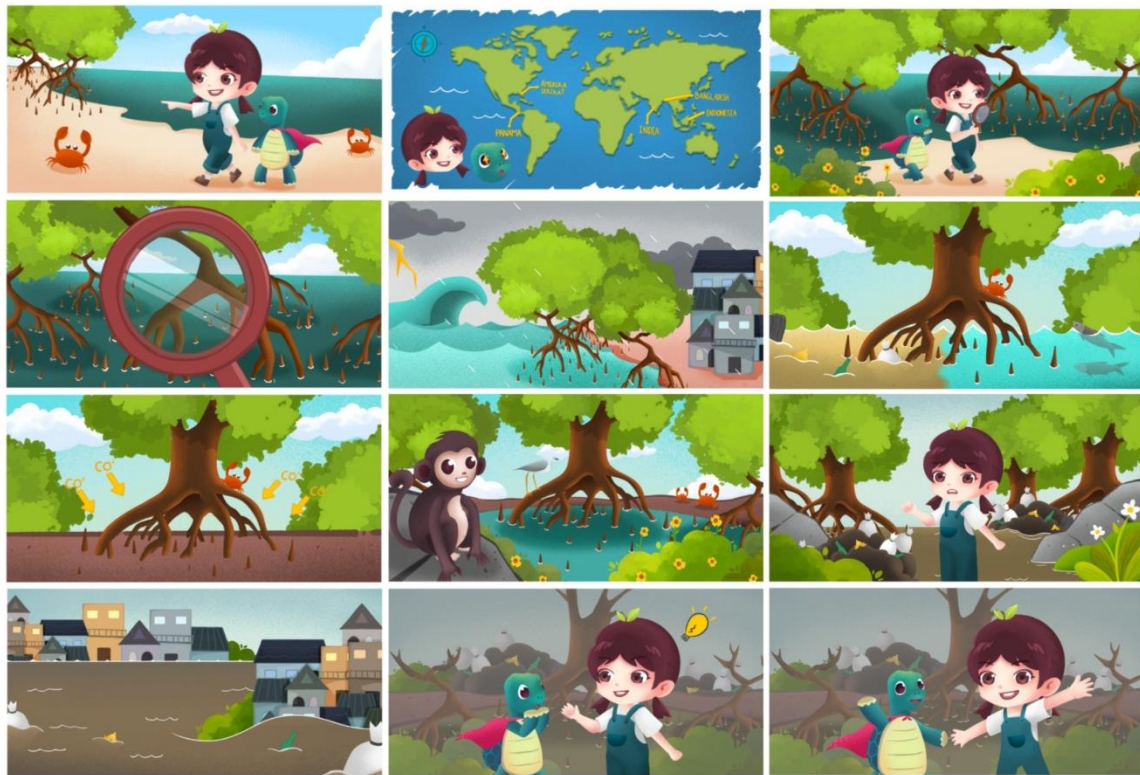


Figure 5. Animation Scene “What is a Mangrove Forest?”
(Source: Author’s personal document)

The second video is titled *“The Threat of Waste to Mangrove Forests”*. This video shifts to a more serious issue, namely the threat of waste to mangrove forests. The story begins with the beauty of the mangrove forest and its animals living peacefully, until at some point, a large amount of waste is carried by the water currents and accumulates among the mangrove roots. Nilo explains how waste can damage the ecosystem, pollute the water, and endanger the living creatures within it. The conflict arises when the negative impacts of waste are shown, highlighting the severe destruction it causes to the mangrove forest. The story concludes with a strong moral message: protecting the environment begins with small actions, such as not littering.



Figure 6. Animation Scene “The Threat of Waste to Mangrove Forests”
(Source: Author’s personal document)

c. Guidelines Book

The Guidelines Book is a manual that provides directions for applying the illustration style, using colors, explaining the characters, describing the production process, and outlining other graphic elements.



Figure 7. Guidelines Book
(Source: Author’s personal document)

5. CONCLUSION

From the series of design processes carried out, it can be concluded that the Design of 2D Animation Illustration Assets for the Wonorejo Mangrove Forest aims to develop educational media that fosters environmental awareness from an early age. The designed illustration assets employ a visually appealing and communicative approach, featuring characters, backgrounds, and supporting elements that represent the mangrove ecosystem in an educational yet enjoyable manner. The semi-flat illustration style was chosen because it conveys messages in a simple yet engaging way, with visuals that are child-friendly. The use of narrative storytelling also serves to reinforce the delivery of moral messages, including the importance of proper waste disposal and environmental preservation. The entire design process, from data collection to asset visualization, was carried out systematically based on educational needs and audience characteristics. By utilizing digital animation media along with supporting materials such as a guidelines book, posters, and educational merchandise, the resulting design is expected to function as both an enjoyable learning tool and a means of raising awareness about the importance of preserving the mangrove forest.

To ensure the continuity of educational messages, it is recommended that the designed 2D animated video content be further developed. Continuous content development, whether in the form of animated series or short episodes, allows environmental preservation messages to be delivered in a more varied and in-depth manner. Each subsequent episode can address different environmental issues or themes within the framework of the mangrove forest, such as introducing various flora and fauna, the impact of climate change on coastal ecosystems, the importance of maintaining water cleanliness, and the role of humans in conserving natural resources. This approach enables audiences to gain broader understanding while avoiding monotony from a single type of information. Further story development can also strengthen the emotional connection between viewers and the main characters, thereby naturally fostering a sense of care and responsibility for the environment. Moreover, with serialized content, there is greater potential to build an active audience community, opening more opportunities for interaction and participation. Through this continuity, the animated videos are expected not only to serve as temporary educational media, but also to grow into a long-term, accessible learning resource that effectively raises environmental awareness among younger generations.

REFERENCES

- Arsita, M., Hasyim, A., & Adha, M. M. (2014). Pengaruh tayangan film kartun terhadap pola tingkah laku anak usia sekolah dasar. *Jurnal Kultur Demokrasi*, 2(7).
- (Azizah & Rianto, n.d.) PENGEMBANGAN EKOWISATA MANGROVE WONOREJO DI SURABAYA
- Dahlan, Z. (2021). Efektivitas Penggunaan Media Motion Graphic sebagai Pendukung Media Pembelajaran Fisika Kelas X IPA di SMA Negeri 3 Baru. Makassar: Universitas Muhammadiyah Makassar.
- Gunarto. 2004. Konservasi Mangrove Sebagai Pendukung Sumber Hayati Perikanan Pantai. *Jurnal Litbang Pertanian*, 23 (1). 15-21.
- Iqlima, R., Dr.Aswar, M.Ds., Lugis, M. M. (2023) Perancangan Buku Kehidupan Laut Akibat Sampah Plastik.

- Kusumo, R. (2021). Ancaman Sampah Plastik di Hutan Mangrove Pesisir dan Upaya Mengatasinya. *GoodNewsFromIndonesia*
[a.https://www.goodnewsfromindonesia.id/2021/09/01/ancaman-sampah-plastik-di-hutanmangrove-pesisir-dan-upaya-mengatasinya](https://www.goodnewsfromindonesia.id/2021/09/01/ancaman-sampah-plastik-di-hutanmangrove-pesisir-dan-upaya-mengatasinya)
- Rahmanda, A. F., Rijal, S. S. (2024). *Peta Kelimpahan Sampah Laut di Ekosistem Mangrove Wonorejo Kota Surabaya, Jawa Timur*. Environmental Pollution Journal, Volume 4 Nomer 2 Juli 2024. (Online) diakses dari: <https://ecotonjournal.id/index.php/epj/article/view/195>
- Rohmandita, D., Munib, J.A. (2022). *Perancangan Karakter sebagai Pendukung Animasi Edukasi Anak Terkait Sampah 4R*. Journal of Visual Communication Design Study & Practice, Vol.2, No.2, Desember 2022.
- (Ruyattman, n.d.) Perancangan Buku Panduan Membuat Desain Karakter Fiksi Dua Dimensi seacara Digital
- Sugihartono R., Herry Prilosadoso., Panindias. (2010). Animasi Kartun: Dari Analog Sampai Digital. Yogyakarta: Indeks.
- Tekman, M. B., Walther, B. A., Peter, C., Gutow, L., & Bergmann, M. (2022). *Impacts of Plastik Pollution in the Oceans on Marine Species, Biodiversity anda Ecosystems*. WWF Germany, Reinhardstraße 18, D-10117 Berlin.
- Wijaya, Y. F., & Muchtar, H. (2019). Kesadaran Masyarakat Terhadap Kebersihan Lingkungan Sungai. *Journal of Civic Education*, 2(5), 405–411.<https://doi.org/10.24036/jce.v2i5.297>