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Building Environmental Awareness Through Animation: Transforming Nature from Plastic Waste

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ABSTRACT
This study examines the role of animation as an effective medium in socializing environmental issues, especially regarding plastic waste management. Through a qualitative approach, this study explores how animation can convey important messages related to reducing plastic waste and preserving the environment to various groups in society. In this case study, animation is used as a communication tool that emphasizes the importance of pro-environmental behavior through an attractive and easy-to-understand visual narrative. The results of the study indicate that animation has great potential to raise awareness and change people's behavior in dealing with plastic waste. With a combination of strong visuals and deep moral messages, animation has proven effective in healing nature from the negative impacts of plastic waste. These findings indicate the need for further development in the use of creative media, such as animation, as an innovative socialization strategy in environmental conservation efforts.

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INTRODUCTION

The impacts of plastic waste on the environment are diverse and serious. Plastic waste pollutes land, water and the ocean, threatening marine life and endangering human health. Non-biodegradable plastics take hundreds to thousands of years to fully degrade, during which time they disrupt soil structure and release hazardous chemicals into groundwater. Examples of these substances include bisphenol A (BPA) and phthalates, which are known endocrine disruptors and can affect the quality of water used for agriculture and human consumption[1]. This contamination has a negative impact on plant growth and human health who consume contaminated products.

In the ocean, plastic poses a major threat to marine animals, polluting ecosystems, and the microplastics that are formed can enter the food chain, posing a risk to human health. Marine animals such as turtles, birds, and fish often mistake plastic for food, which can cause digestive tract blockages, internal injuries, and even death.[2]. Additionally, microplastics—tiny particles of degraded plastic—have been found in the bodies of various marine species, which are then consumed by humans through seafood, posing potential health risks, including organ damage and reproductive system disorders.[3].

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Plastics contain harmful chemicals that can cause health problems. Chemical compounds such as BPA and phthalates, which are commonly found in plastic products, have been linked to a variety of health problems such as hormone disruption, cancer, and developmental disorders in children.[4]. BPA, for example, is known to mimic the hormone estrogen in the body and disrupt the endocrine system, which plays a vital role in the body's development and metabolism.

Economically, plastic waste causes huge costs to clean up and damages the fishing and tourism industries. Plastic waste that pollutes beaches and oceans not only requires huge costs to clean up, but also reduces the attractiveness of tourist destinations, which has a negative impact on the tourism industry in the area. The fishing industry is also affected by the decline in fish numbers due to the destruction of their natural habitat, as well as contamination that impacts the quality and safety of seafood.[5].

The production and disposal of plastic also contribute to greenhouse gas emissions, worsening climate change and damaging the aesthetics of the environment. From the production stage to the incineration of plastic waste, this process releases large amounts of greenhouse gases such as carbon dioxide (CO2) and methane (CH4) into the atmosphere, accelerating global warming and climate change.[6]. The aesthetic impact also cannot be ignored, because plastic scattered in the environment disrupts the beauty of nature and reduces the quality of life of local communities.

Treating nature from plastic waste is an important step to maintain ecosystem balance and environmental sustainability. Non-biodegradable plastics take a long time to decompose and during this time pollute the soil, water, and air, damaging ecosystems and endangering living things. Every year, around 8 million tons of plastic waste enters the ocean, threatening marine life and the food chain, and potentially endangering human health. Effective plastic waste management can reduce the demand for new plastic production, which contributes to the conservation of natural resources and the reduction of greenhouse gas emissions, thus helping to prevent climate change. In addition, treating nature also involves educating the public to raise environmental awareness, reduce the use of single-use plastics, and support environmentally friendly policies, all of which contribute to a better quality of life.

Animation is an effective visual medium for conveying complex messages in an engaging and easy-to-understand way. Its strengths include the ability to capture attention through moving images and color, and simplify abstract concepts with creative visualizations.[7]. In the context of environmental communication, animation offers an intuitive approach to illustrating ecological impacts that are difficult to grasp with the naked eye, such as plastic pollution in the oceans.[8]. Animation is perfect for communicating difficult issues, such as the environmental impact of plastic waste, in a way that is easy to understand and emotional. The use of animated characters can increase emotional connection and awareness among audiences, making the message more resonant and inspiring action.[9]. In addition, animations can be published on multiple digital platforms, translated into multiple languages, and used interactively, making them an effective tool for global outreach and broader discussion.[10]. In this context, animation not only functions as a

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communication tool, but also as a medium that can facilitate social transformation through environmental education and advocacy.

The urgency of this research is that plastic waste is a serious and increasing environmental problem. Plastic is not easily decomposed and can pollute the environment for hundreds of years. The urgency of this research arises because of the urgent need to find new and effective ways to overcome this crisis, especially in raising public awareness. Animation has great potential in conveying messages visually and attractively, especially to reach a wider audience. Through animation, messages about the importance of caring for nature and the dangers of plastic waste can be conveyed in a way that is easier for the public to understand and remember.

One of the main goals of socialization is to change people's behavior to be more environmentally conscious. This research is urgent because behavioral change is key to reducing plastic waste production and disposal. By using animation as a medium, this research seeks to create a significant impact on public awareness and action.

Innovative and creative environmental campaigns are urgently needed to attract public attention. This research is important because it can pave the way for the use of animation as an integral part of environmental campaigns, providing a new alternative that is more engaging and effective compared to traditional methods. This research also emphasizes the urgency of combining environmental science disciplines with the art of animation, creating collaborations that enrich the approach to solving complex problems such as plastic waste. It also encourages the integration of knowledge from various fields for more holistic and impactful results.

METHOD

This study uses a qualitative approach with an action research method that focuses on the use of animation as an educational medium. The steps taken include: Literature study and observation, namely collecting data from literature related to environmental issues, especially the impact of plastic waste, and animation as a socialization medium. Observations are carried out to understand the community's perspective on the issue of plastic waste. Next, the animation is designed and developed. This process involves creating a storyboard, character design, and narrative that combines the cultural concept of "meruwat alam" to increase the closeness of the message to the local audience. After the animation is completed, a trial and evaluation are carried out. The animation is tested on selected audiences through a screening session, then an evaluation is carried out to measure the audience's understanding, reaction, and level of environmental awareness of plastic waste. Qualitative data is collected through interviews and questionnaires. The results of the trial are analyzed to see the effectiveness of the animation in increasing environmental awareness. The analysis is carried out descriptively qualitatively to provide insight into the success of the animation in conveying the message.

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RESULTS AND DISCUSSION

Definition of plastic waste

ThePlastic waste is any type of plastic material that is discarded after use and no longer has any economic or functional value. Plastic, which is a synthetic or semi-synthetic material made from polymers, has become one of the most widely used materials in the modern world. The properties of plastic such as being lightweight, durable, and malleable, make it an ideal material for a variety of products ranging from food and beverage packaging, water bottles, household appliances, to electronic devices. However, these advantages also make plastic one of the main contributors to environmental problems. Plastic does not easily decompose naturally, with most types of plastic taking hundreds to thousands of years to degrade in nature. As a result, plastic waste accumulates in the environment, causing pollution of land and water, and even entering the food chain through microplastics that accumulate in marine organisms. According to a study published in the journal Science, around 8 million metric tons of plastic end up in the ocean every year, which is equivalent to dumping one garbage truck full of plastic every minute. This impact has sparked global concern, prompting efforts to reduce the use of single-use plastics and increase recycling and innovation of more environmentally friendly alternative materials.[11].

However, after use, plastic often does not naturally decompose in the environment, causing accumulation in landfills, oceans, rivers, and other environments. This plastic waste can take various forms, such as plastic bags, bottles, food wrappers, straws, and microplastics which are small pieces of larger plastic.

The existence of plastic waste is a serious environmental problem because it can pollute the soil, water, and air, and pose a threat to animal life and ecosystems. Plastic waste is also difficult to decompose, taking hundreds to thousands of years to completely degrade in nature, thus significantly increasing the environmental burden.

The concept of caring for nature from plastic waste

Purifying nature is a cultural concept that originates from local traditions in several regions in Indonesia, such as Bali. This term is often associated with ceremonies or rituals that aim to "cleanse" or "purify" the environment from various disturbances or pollution, both physical and spiritual. In Balinese tradition, for example, there is the tumpek uduh ritual, which is a form of respect for nature with the aim of maintaining the balance and purity of the environment. This concept reflects the close relationship between humans and nature in the context of local beliefs and customs, where nature is considered to have a soul and power that must be respected and its balance maintained. In a modern context, these rituals can also be interpreted as a form of local wisdom in preserving the environment from the threat of pollution, including plastic waste, which is a global issue. Research shows that these traditional practices have important ecological value and can be an inspiration in developing sustainable environmental conservation strategies.[12].

In Balinese culture, purifying nature usually involves religious ceremonies held in specific places, such as temples or sacred locations. These ceremonies involve offerings, prayers, and other symbols to honor and maintain the balance of nature. These ceremonies

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are part of the Balinese Hindu belief system that believes in a harmonious relationship between humans, gods, and the environment.

The community plays an active role in carrying out this ritual as a form of responsibility towards the environment. They believe that by performing meruwat alam, they can avoid disasters, reduce spiritual disturbances, and ensure community welfare and environmental sustainability.

In the environmental context, meruwat alam can not only be interpreted as an effort to maintain and preserve the sustainability of the environment through actions involving cleaning, restoration, and protection, but also as a form of integration of local knowledge with modern conservation strategies. This activity includes various actions, such as collecting garbage, cleaning rivers, beaches, or forests from waste that can pollute or damage the ecosystem. This ritual is important in a cultural and spiritual context, because it illustrates the harmonious relationship between humans and nature, and reflects the responsibility of the community towards their surrounding environment. Meruwat alam is a practical form of physical action that not only restores the cleanliness and balance of the environment, but also strengthens collective awareness of the importance of preserving nature as part of the cultural heritage that must be maintained. Research shows that the integration of traditional practices and modern scientific approaches in environmental conservation can produce more effective and sustainable conservation strategies.[13]. Thus, local practices such as nature healing play an important role in global efforts to reduce negative impacts on the environment and preserve ecosystems for future generations.

Nature care can also include efforts to restore natural habitats that have been damaged by human activity. This can involve reforestation, land rehabilitation, or restoration of degraded areas to restore their ecological function. Applying the principles of nature care also involves education and awareness about the importance of protecting the environment. This includes environmental campaigns, training on environmentally friendly practices, and promotion of sustainable practices.

The concept of meruwat alam connects aspects of culture with the environment through mutually supportive actions and beliefs. Cultural rituals involving meruwat alam often have the same goals as modern environmental practices, namely maintaining balance and sustainability.

Many traditional cultures understand the importance of maintaining harmony with nature, and this is reflected in their ceremonies and customs. The concept of meruwat alam shows how cultural practices can contribute to environmental preservation. Understanding and preserving cultural heritage such as meruwat alam also means respecting long-standing knowledge and practices that contribute to environmental sustainability.

Animation as a communication medium

Animation is a unique medium because of its ability to create visuals that are impossible to achieve with other media. In this context, animation can visualize abstract or futuristic concepts that are difficult to explain through conventional images or videos. For example, animation can depict biological processes occurring within an ecosystem or global climate change in an imaginative and intuitive way. This ability makes animation a powerful tool in

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capturing attention and raising awareness about pressing environmental issues. For example, research shows that animated visualizations can increase public understanding of complex issues such as climate change and environmental conservation.[14].

Environmental issues often involve very complex data and processes, such as statistics on pollution levels or simulations of future climate change. This is where animation becomes essential. By using dynamic graphs, charts, and visualizations, animation can simplify this information so that it is more easily understood by the general public. Animation allows for clear and engaging messaging, helping the audience not only understand the impact of environmental issues, but also understand the solutions that can be implemented.[15]. Thus, animation not only functions as a communication tool, but also as an effective educational media in inviting the public to care about environmental issues.

Animation allows for visualization of changes that occur over time, such as the effects of climate change or the impact of environmental pollution. By showing future scenarios, animation can show the long-term consequences of human actions on the environment. Animation can generate empathy by bringing characters and situations to life, making the audience feel more emotionally connected to the message. With relatable characters and touching stories, animation can raise awareness and encourage action.

Animation has incredible flexibility in combining various visual elements, such as symbols, metaphors, and fantasy, to convey messages in ways that other media would not be able to achieve. This ability allows animation to visualize creative ideas and innovative solutions, which may be difficult or impossible to realize in conventional media. For example, in conveying environmental issues, animation can depict the long-term impact of plastic pollution on the ecosystem in a way that is not only informative but also emotional, using symbolism and futuristic visuals to generate awareness and urgency among the audience.

Additionally, animated content tends to be more engaging and easily accepted by a wide audience, across ages and backgrounds. With its engaging visual elements and engaging narrative, animation is able to bridge the communication gap that often arises when communicating complex issues, such as environmental issues. This not only increases audience engagement, but also allows for more effective message dissemination. Animation and comics have the unique ability to simplify and highlight important elements, making them highly effective communication tools in conveying complex messages in a way that is accessible to everyone.[16].

Animation can be used across platforms such as social media, television and websites, and can be adapted to the appropriate format for each platform. This allows for a more effective and widespread dissemination of environmental messages. Animation allows for powerful storytelling with a clear plot and developed characters. By presenting stories about environmental issues in an engaging narrative, animation can help audiences understand and remember the message better.

Advantages of animation as a socialization medium

Animation has several advantages as a social media that makes it very effective in conveying messages to various audience groups. First, animation is able to attract more people's attention, especially in the digital era where attractive visuals are very important.

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Elements such as color, movement, and character design in animation can create a more engaging experience compared to static media, making the message conveyed more likely to be remembered and understood. In addition, animation allows the delivery of complex narratives to be simpler and easier to understand. Abstract or difficult-to-explain concepts can be visualized in an intuitive and immersive way, making information more accessible to a wider audience. For example, research shows that visualization through animation can improve comprehension and retention of information, especially when dealing with complex or technical content.[17].

Because of its visual and fun nature, animation is accessible and enjoyable for audiences of all ages, including children. This makes it an effective medium for reaching a wide audience with diverse backgrounds. In animation, many messages can be conveyed through images and symbols, thus reducing the reliance on language. This makes animation more easily understood by people from different languages and cultures.

Animation can be used in various formats, such as short videos, animated infographics, or social media, making it flexible in delivering messages across platforms. Animation can create an emotional connection with the audience through characters and stories, making the message more relatable and well-received. These emotions are often key in motivating changes in attitudes or behavior. Because of the combination of visuals, audio, and narration, information conveyed through animation tends to be more memorable to the audience. This is especially useful in socialization campaigns that require long-term impact. Compared to video production with real actors and locations, animation is often more affordable and flexible. In addition, animation can be adapted more easily if there are changes in the message to be conveyed.

Advantages and disadvantages of animation compared to other media

The beauty of animation lies in its ability to visualize abstract and complex concepts or ideas, which may be difficult or even impossible to convey through other media such as live video or posters. For example, molecular simulations showing atomic interactions or dynamic representations of global climate change can be brought to life through animation, allowing for the visual and engaging delivery of complex scientific information. Animation gives creators the freedom to express their imagination without being constrained by the laws of physics or real-world realities. This allows for the creation of worlds, characters, and visual effects that would be impossible to create with conventional media. One of the most appealing aspects of animation is its high visual appeal, especially when designed well. This makes it a very effective tool in capturing the attention of an audience, especially children who are more responsive to visual stimuli that are colorful and moving. Through animation, complex messages can be simplified into something more easily understood. Long or complicated processes, such as the life cycle of a product or a chain of chemical reactions, can be summarized and explained more clearly through a strong visual narrative. Additionally, animated content is easier to edit or modify than live video, which may require reshoots and re-set locations. This flexibility makes animation an ideal choice for social and educational media in various fields, including science and environmental issues.

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However, animation also has its drawbacks, especially high-quality animation, often requiring more time and money to produce compared to other media such as live video or posters. The complex animation production process involves various stages, from design concepts, storyboards, modeling, to rendering, which require in-depth technical and creative expertise.[18]. While animation can visualize abstract concepts, creating realism in animation can be challenging and may not be as effective as live video in depicting real-world situations. Creating animation requires specialized skills in graphic design, programming, and animation, which not everyone has. This can be a barrier for individuals or small organizations who may not have the necessary resources or skills.[19].

Additionally, some audiences may find animation less serious or irrelevant, especially when compared to other media such as documentaries or posters that are more realistic and direct. Animation is usually one-way, whereas some other media (such as live video or presentations) allow for direct interaction with the audience, which can enhance understanding and engagement.[20].

Animation Production Process

The animation production process in this study follows the animation production stages which include Pre-Production, Production, and Post-Production. Pre-production is the initial stage in making animation which is very important to ensure that all aspects of the project are well planned before entering the production stage. Pre-production begins with the concept development process. In this process, the purpose of this animation is clearly defined, namely to increase public awareness of the importance of protecting nature from plastic waste and how steps to care for nature can be taken. Furthermore, determining the main message to be conveyed, such as the negative impact of plastic waste on the environment and ways to reduce or manage plastic waste.

After determining the objectives, then the target audience is identified, in this case the target audience is teenagers to adults or the general public. From the target audience, an effective storyline is formed that includes an introduction to the problem (plastic waste), a solution to treating nature, and a call to action. Based on the problem, solution and invitation, an informative but interesting dialogue and narrative are then created and the language used is adjusted to the target audience. Furthermore, determining the effective animation duration to convey the message without making the audience bored. For this reason, this socialization animation is made with a duration of 3-5 minutes, which is considered effective.

In relation to character design, it is made to represent the audience or symbolize nature. Background or environmental design used in animation, such as forests, rivers contaminated by plastic waste. Continued by determining the color palette and visual style that suits the theme. Green, blue, and brown may be dominant to represent nature, while bright colors can be used to attract attention.

The next stage is making a storyboard. A storyboard is made to visually describe each scene in the animation. The storyboard in this animation is made to include all the main elements such as characters, backgrounds, and important objects. The storyboard also determines the camera movement in each scene, such as zoom in, zoom out, panning, or still.

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This aims to help the animator understand how the scene should be arranged. In addition, planning transitions between scenes is carried out to keep the storyline smooth and flowing.

After that, the voice actor for the character or narrator is determined. The voice chosen is in accordance with the character and can communicate the message effectively. At the same time, choosing or composing background music that supports the animation atmosphere. The music chosen and used is music that can strengthen the emotions that are to be displayed, such as concerns about pollution or hopes when nature is restored. Sound effects are also chosen to enhance the realistic impression in the animation, such as the sound of flowing water, birds chirping, or the sound of plastic creaking.

The final stage carried out in pre-production is determining the animation software used based on the project needs, which in this case are selected such as Adobe After Effect, Adobe Premiere, and software for illustration. Also determined is the final format of the animation and the resolution needed to suit the distribution platform, namely social media.

At the production stage, the execution is carried out on what has been prepared during pre-production. The animator team begins the character design stage, making a story script that begins with conducting interviews with sources. Next, create key animations (key images), inbetweens (intermediate images), and backgrounds. Next, enter the editing process, namely editing and composing shots which are divided into 2 stages, namely offline editing and online editing.

In the final stage, namely post-production, the chief researcher who is also the director accompanies the editor to evaluate the overall results of the animated scenes. Then continue to select important scenes or scenes used before editing the images. The next process is rough cut by editing starting with cutting referring to the editing script. Then arrange a series of appropriate scenes from the selected scenes. After previewing the rough cut results at this stage the editor fixes the rough cut results based on the preview results. At this stage the editor and director determine the flow, rhythm, and tempo in the animated video before mixing. Next, the sound and voice over editing process is carried out, which is the process of editing sound on the dialogue and narrator.

CONCLUSION

The conclusion of the discussion above is that plastic waste is a serious environmental problem because it is difficult to decompose naturally and can pollute various aspects of the ecosystem. To overcome this problem, the concept of purifying nature from local cultural traditions in Indonesia, such as those practiced in Bali, can be an inspiration in environmental conservation efforts. Purifying nature not only involves cultural rituals, but also includes real actions such as cleaning and restoring the environment. Animation has great potential as a communication medium in conveying environmental messages. With attractive visualizations and the ability to simplify complex concepts, animation can increase public awareness and involvement in protecting the environment. The animation production process involving pre-production, production, and post-production stages ensures that the message conveyed is effective and in accordance with the target audience. Animation as a socialization medium offers advantages in attracting attention, simplifying complex narratives, and reaching a wide

audience. Despite its shortcomings such as high production costs, animation remains a strong and flexible medium in conveying environmental messages, especially related to the importance of purifying nature from plastic waste.

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