

CHARACTER DESIGN FOR ECO WARRIORS EDUCATIONAL GAME AS A WASTE MANAGEMENT EDUCATION MEDIUM

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Abstract

The waste problem in Indonesia requires effective education from an early age to develop environmental awareness among the younger generation. Educational games can be an effective educational medium if they have attractive and easily understood characters for children. This research aims to design characters for the *Eco Warriors* educational game as a waste management education medium. The research method uses literature study with a design process that includes design concept, sketching, digitalization, and character finalization. The research results consist of boy and girl character designs with environmental hero concepts that can be implemented in the development of waste management educational games as an effective and attractive educational medium for children.

Keywords: Character Design, Educational Game, Waste Management

INTRODUCTION

Indonesia faces significant challenges in waste management that have serious environmental impacts. Data from the National Waste Management Information System (SIPSN, 2024) shows that out of 277 regencies/cities, only about 17.9 million tons of waste per year are successfully managed. Meanwhile, about 11 million tons of waste per year have not been optimally handled. As a result, Final Disposal Sites (TPA) experience overcapacity, triggering various environmental problems such as soil, water, and air pollution.

This waste problem is not only caused by limited facilities or technology, but is also closely related to community behavior. (Christine et al., 2022) suggest that low public awareness of the importance of waste management is one of the main causes. This is in line with the view of (Amri & Widyanoro, 2017) who emphasize that changes in community behavior have a greater impact compared to mere technology implementation. Therefore, long-term solutions must start with changing mindsets and community habits from an early age.

One effort to form positive habits from an early age is through environmental education for children. Research by (Anggreana et al., 2021) shows that children who are accustomed to sorting and disposing of waste properly from an early age will grow into environmentally conscious individuals. However, the effectiveness of this education greatly depends on the suitability of delivery methods with children's developmental stages. (Masitoh et al., 2009) state

that children tend to learn more optimally through play activities that involve all senses, such as visual, auditory, and kinesthetic.

Educational games become one of the relevant learning media for children. (Halidah, 2018) found that children are more motivated to learn through games compared to conventional methods. Furthermore, according to (Rahman & Sari, 2020), games facilitate the learning process through direct experience (*learning by doing*) that allows children to understand important information in an enjoyable way. Through this method, children not only gain understanding but can also form positive attitudes and habits towards waste management.

In educational game design, character design plays an important role as a visual element that attracts attention while serving as a medium for message delivery. Well-designed characters can become the identity of a game (Trihanondo, 2010). Such designs can also contain information and values to be conveyed (Maharani et al., 2024). One approach that is relevant for children is the use of *chibi* illustration style, which is a visual style with small body shapes, cheerful facial expressions, and cute proportions (Togashi, 2005). This style is considered suitable for children's visual preferences who like simple, expressive, and easily recognizable appearances (Suherdja, 2016).

The character design process in educational games includes several stages from concept design creation, sketching, digitalization to character finalization. Characters need to be designed considering physical aspects, aesthetics, personality, and their role in game narrative, particularly in two-dimensional format (Hahury, 2022).

Several previous studies have shown the importance of character design in educational game development. Ngakan Putu Darma Yasa & I Gede Adi Sudi Anggara (2022) titled "Character Design and Background Design for Game Assets: Clownfish Adventure" This research shows that character and background design play important roles in increasing game attractiveness. The main objective was to design clownfish characters and underwater backgrounds as 2D educational game assets using Adobe Flash CS6. With observation, documentation, and implementation methods, the design process was carried out from sketching to coloring. The design results were adapted to children's themes through cartoon vector style and application of graphic design principles to create visually attractive and educational content.

Similar research was conducted by Umaimah, Z. A., Rachman, A., & Kurniawan, R. A. (2023). "Character Design from Indigo Plant (*Indigofera tinctoria*) as Introduction to Indonesian Flora Diversity" discussing the process of designing characters based on local flora. The creation steps include literature study, problem formulation, and prototype creation as initial character design concepts, which were then refined to produce final character designs.

Fadillah, R., Deanda, T. R., & Rahadiano, I. D. (2025). "Character design for educational games about forest fire handling and prevention in Wonosobo for young adults" This research aims to design an educational medium, namely an educational game containing forest fire handling and mitigation steps, with the job description of designing *Character Designer* for forest fire educational games. The method in this research uses data collection methods such as conducting observations in target areas, interviewing relevant parties, and literature study about forest fires and Character Designer from several books and journals. Thus, this research focuses

on Character Design aimed at approaching hikers and the general public in creating more lively gaming experiences and deeper emotional feelings during gameplay.

Based on this background, this research aims to design characters for educational games with waste management themes. It is hoped that the results of this research can serve as an example for developing effective environmental education character designs for children.

IMPLEMENTATION METHOD

This research uses qualitative research methods based on literature study from various relevant sources. Meanwhile, in creating this character design work, the creation method is based on character design stages. The qualitative method was chosen because this research aims to explore and understand in depth the process of designing educational game characters.

Literature study is a data collection method conducted through examination of various relevant sources, such as books, articles, and scientific journals (Sugiyono, 2019). This method is used to obtain deep theoretical foundations regarding character design and environmental educational games, through collection and analysis of literature and results of previous research related to the research topic.

In the character design stage for eco warriors educational game characters, the creation steps include literature study process, problem formulation, and brainstorming to produce initial character design concepts, then continued with *finishing* to obtain design results or final design of the designed characters.

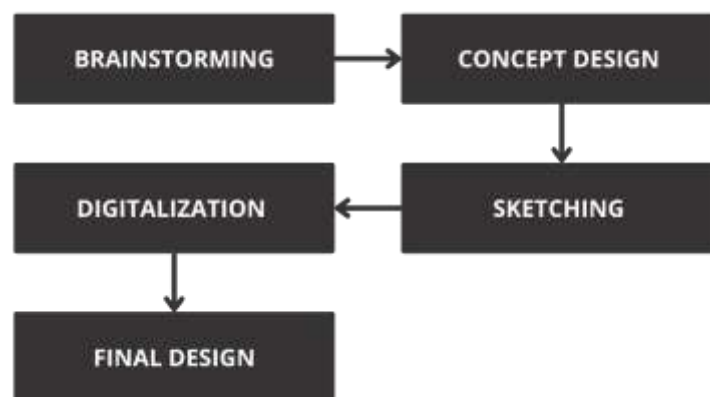


Figure 1. Character Design Development Stages

Source : Author's Documentation

RESULTS AND DISCUSSION

Based on the design process, the following are the results of each stage in designing characters for the *Eco Warriors* educational game. Each design stage was carried out systematically and structured to ensure the resulting characters match the needs of the target users, namely elementary school-age children. This process also considers children's visual preference aspects so that educational messages about waste management can be effectively conveyed. The following are the results of each stage in designing characters for the *Eco Warriors* educational game:

1. Brainstroming

The initial stage in the character design process begins with *brainstorming* activities aimed at exploring various creative ideas and determining the visual concept direction to be developed. This process was conducted considering the needs and characteristics of main users, namely elementary school-age children who are the target of the *Eco Warriors* educational game. Additionally, relevant visual references were collected, such as environment-themed illustrations, children's animated films, and literature related to character design and environmental education. Based on various collected references, the authors used the *mind mapping* method to maximize creative thinking potential. Through this method, the authors compiled a *mind map* regarding several possible character forms to be visualized. *Brainstorming* is a creativity technique that seeks problem-solving by spontaneously collecting ideas.

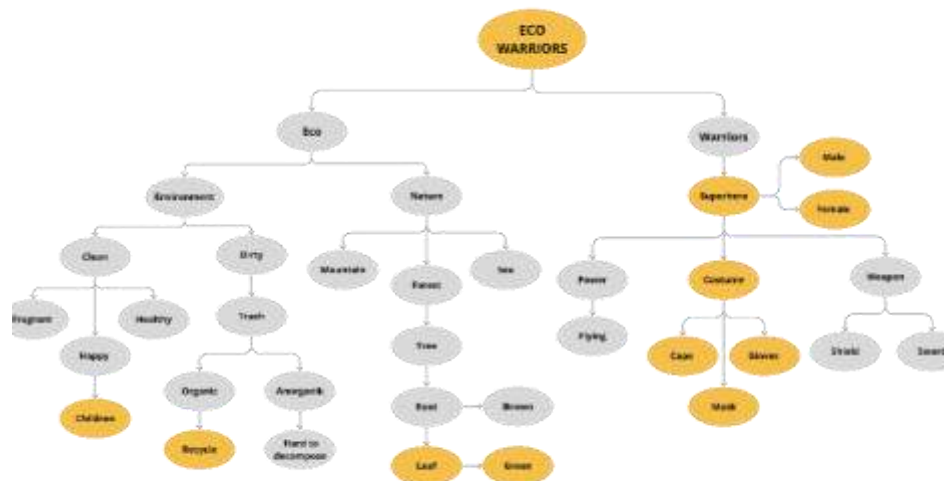


Figure 2. Mind Map for Eco Warriors Character Design
Source : Author's Documentation

Based on the *mind map* results, the *Eco Warriors* character concept was formulated as a superhero figure. Selected visual elements include costumes, capes, masks, gloves, leaves, green color, and recycling symbols. The main characters consist of one boy and one girl wearing complete green costumes with capes, masks, and gloves.

2. Concept Design

Concept determination was done after the idea collection process through *mind mapping*. The compiled data then became the concept for character design. The main concept in this design is children as environmental heroes. The visual design of characters in the *Eco Warriors* educational game is designed with an attractive and child-friendly approach to increase player engagement in understanding waste management issues. The main characters, Elio and Cylla, are illustrated as environmentally conscious superheroes. The first character, Elio, wears a green costume with a recycling symbol on the chest and a blue cape. Meanwhile, the second character, Cylla, appears with a similar costume but distinguished by a red cape. Both characters are

equipped with visual elements such as masks, gloves, and yellow shoes with green leaf accents. The next stage is illustrating the character design in sketch form.

Table 1. Eco Warriors Character Design Concept

No	Element	Elio (Male)	Cylla (Female)
1	Main Costume	Green with Recycle symbol	Green with Recycle symbol
2	Cape	Blue	Red
3	Accessories	Mask, Yellow gloves	Mask, Yellow gloves
4	Shoes	Yellow with green leaf accents	Yellow with green leaf accents
5	Visual Style	Chibi, child-friendly	Chibi, child-friendly

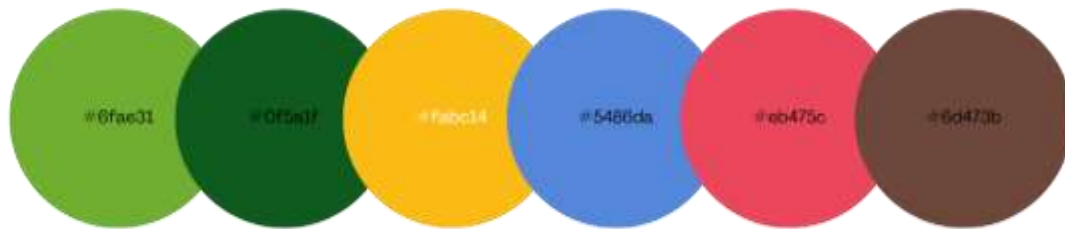


Figure 3. Color Palette for Eco Warriors Character Design

Source : Author's Documentation

3. Sketching

This sketching stage is the initial step in character design. According to (Yulianti, 2021:6), the character design process begins with sketches as initial designs based on previous analysis. Character design creation begins with concept development through initial sketches as visualization forms of established designs. Sketches function to illustrate basic character forms, facilitating the design process in determining appropriate appearances for Eco Warriors characters. Sketches were made manually using paper and pencil media, then after being considered suitable, the sketches were transferred to digital format for digitalization.



Figure 4. Eco Warriors Character Design Sketches

Source : Author's Documentation

4. Digitalization

Manually created sketches then go through digitalization process with software assistance. In this design, the application used is *Adobe Animate*. The digitalization process includes *outline* and *coloring* stages. Manual sketches were first transferred to *Adobe Animate* worksheets as the basis for digital design process.



Figure 5. Digital Sketches Eco Warriors Character Design

Source : Author's Documentation

After sketches are entered into the worksheet, the next stage is *outlining*, which is redrawing sketch lines using *Line tool* to appear neater and ready for the *base coloring* stage.



Figure 6. Outline Eco Warriors Character Design

Source : Author's Documentation

The next stage is *coloring*, which is the final process after sketching and outlining are completed. Coloring begins with giving *base color*, which is basic color without *shading* or gradation. This stage is important for determining the main colors of character design.



Figure 7. Base Colors Eco Warriors Character Design
Source : Author's Documentation

The final stage in the *coloring* process is adding shadows and color gradation. Adding these elements aims to provide depth, dimension, and more lively visual impressions to characters, making them appear more attractive.



Figure 8. Eco Warriors Character Design Results
Source : Author's Documentation

5. Final Design

The resulting character design has visual characteristics suitable for target users, namely elementary school-age children. The use of bright colors and chibi illustration style makes characters appear attractive and memorable. Environmental symbols such as recycling and dominant green colors strengthen educational messages about waste management.



Figure 9. Final Design Eco Warriors Character

Source : Author's Documentation



Figure 10. Eco Warriors Character Poses

Source : Author's Documentation

CONCLUSION

This research successfully designed characters for the Eco Warriors educational game as an effective and attractive waste management education medium for children. The design process including brainstorming, sketching, digitalization, and finalization produced two main characters, Elio and Cylla, with environmental hero concepts. Character design uses a child-friendly visual approach with chibi illustration style, bright colors, and easily understood environmental symbols. The resulting characters can be implemented in waste management educational game development to increase environmental awareness among young generations from an early age. Future research can develop implementation of these characters in interactive educational game forms and test their effectiveness as educational media.

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