

Character Design for an Interactive Illustrated Book on Diarrhea Prevention for Children Aged 10-11 Years

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ABSTRAK

Diare merupakan penyakit umum pada anak usia sekolah dasar yang dapat mengganggu proses belajar dan berdampak pada kesehatan jangka panjang. Rendahnya kesadaran terhadap Perilaku Hidup Bersih dan Sehat (PHBS) serta konsumsi jajanan yang tidak higienis di sekolah menjadi penyebab utamanya. Perancangan ini bertujuan menciptakan buku ilustrasi interaktif sebagai media edukatif untuk menyampaikan pesan pencegahan diare melalui penerapan PHBS. Metode perancangan meliputi observasi, wawancara, studi pustaka, dan analisis data yang kemudian dikembangkan menjadi konsep visual. Buku dirancang dengan ilustrasi kartun bertekstur pensil, bahasa yang ringan, serta fitur interaktif seperti pop-up dan lift the flap untuk meningkatkan keterlibatan anak usia 10–11 tahun. Hasilnya adalah media belajar yang tidak hanya informatif tetapi juga menyenangkan, serta mampu mendorong anak untuk memahami dan menerapkan hidup bersih dan sehat.

Kata Kunci: edukasi, ilustrasi karakter, PHBS

ABSTRACT

Diarrhea is a common illness among elementary school children that can disrupt the learning process and have long-term health impacts. The main causes are low awareness of Clean and Healthy Living Behavior (CHLB) and the consumption of unhygienic snacks at school. This design aims to create an interactive illustrated book as an educational medium to convey messages about diarrhea prevention through the implementation of CHLB. The design process includes observation, interviews, literature review, and data analysis, which are then developed into a visual concept. The book is designed with cartoon-style illustrations featuring pencil textures, simple language, and interactive features such as pop-ups and lift-the-flap elements to enhance engagement for children aged 10–11. The result is a learning medium that is not only informative but also enjoyable, encouraging children to understand and practice clean and healthy living.

Keywords: education, character illustration, PHBS

INTRODUCTION

School-age children and school snacks are closely associated, as purchasing and consuming snacks at school is a common part of children's daily routines. However, school snacks may still pose considerable risks due to their nutritional content and potential impact on children's health and development. Unfortunately, among children aged 6–12 years, this issue has not always received sufficient attention. As a result, many children continue to consume school snacks indiscriminately without considering their hygiene, safety, or nutritional quality. The low quality of snacks consumed by children may consequently increase their risk of developing various health problems (Wulandari et al., 2022). Snack foods sold outside school premises are, in fact, among the foods most frequently consumed by elementary school children. Inappropriate choices of snacks may negatively affect

children's nutritional health. In addition, snacks sold outside school premises are often a concern in terms of hygiene and food safety. A survey conducted by the Indonesian Food and Drug Authority (BPOM) found that, among 866 elementary schools across 30 cities, 34% did not meet health standards (Helmi Chentia, 2024). One of the diseases that may arise from these conditions is diarrhea, which is one of the most common illnesses experienced by elementary school-aged children. Diarrhea is generally associated with inadequate implementation of clean and healthy living behaviors, exposure to contaminated environments, and the habit of consuming school snacks without considering their hygiene and safety (Cahyani et al., 2022).

Based on data from the World Health Organization (WHO), diarrhea ranks as the third leading cause of death among children under five worldwide. Although diarrhea is generally a preventable and treatable disease, it continues to contribute to approximately 443,832 deaths among children under five and 50,851 deaths among children aged 5–9 years. Globally, approximately 1.7 billion cases of diarrhea occur among children each year, with the majority occurring in developing countries. The African and Southeast Asian regions account for approximately 78% of the total global burden of diarrhea. The disease remains one of the major causes of morbidity and mortality among children. Most cases of diarrhea are associated with the consumption of contaminated food and water. Globally, approximately 780 million people still lack access to safe drinking water, while 2.5 billion people do not have adequate sanitation facilities. Consequently, infectious diarrhea is more prevalent in developing countries.

Data from the 2018 Basic Health Research (Riskesdas) indicated that the prevalence of diarrhea among children reached 8%. This figure reflected a significant increase compared with 2013, when the prevalence was recorded at 4.6%, rising to 6.8% in 2018. Furthermore, according to a 2019 report by the Ministry of Health (Kemenkes), as cited by Chentia et al. (2024), 182,338 children aged 5–14 years, or approximately 6.2%, experienced diarrhea. East Java was recorded as the province with the second-highest number of diarrhea cases nationally, accounting for 7.6% or 151,878 cases. Of these cases, nearly half were reported in Surabaya, with 78,463 cases of diarrhea (Arifin et al., 2023). These data indicate that diarrhea remains a significant health problem among children that requires serious attention, particularly in developing countries such as Indonesia (KPPPA, 2019).

According to the Guidelines for Developing Sanitation in Elementary Schools issued by the Ministry of Education and Culture (Kemendikbud), water quality, sanitation facilities, and the implementation of Clean and Healthy Living Behaviors (PHBS), such as the practice of washing hands with soap at school, can contribute significantly to reducing student absenteeism, with reductions ranging from 21% to 54%. In addition, the habit of regularly consuming drinking water at school can help improve students' focus and comprehension during the learning process. Indirectly, the practice of washing hands with soap and the availability of drinking water at school can contribute to improved academic achievement (Khamim & Waluyo, 2018).

A well-known theory of cognitive development was proposed by Piaget. According to this theory, elementary school-aged children between 7 and 11 years old are in the third stage of cognitive development, known as the concrete operational stage. During this stage, children begin to develop logical reasoning abilities, although their thinking remains closely associated with concrete and tangible experiences (Trianingsih, 2016). This characteristic was considered in designing characters for children aged 10–11 years by combining figures that are familiar and relatable to children's everyday lives with imaginative visual elements. One of the approaches applied is shape psychology, which utilizes basic shapes and visual characteristics to create particular impressions and convey the personality of a character.

Therefore, the forms used in character design are not selected solely based on aesthetic considerations but are also adapted to the personality, role, and function of each character within the narrative.

Based on the shape psychology analysis, the three characters were designed using different combinations of shapes to distinguish their respective personalities and functions. Ola is predominantly characterized by circular and curved shapes, creating an impression of cheerfulness, friendliness, and childlike qualities. Bu Vero combines curved forms with more structured shapes to convey a caring yet trustworthy impression appropriate for her role as an educator. Meanwhile, Super Bu Vero incorporates more defined and dynamic shapes in her costume to create an impression of activeness, strength, and enthusiasm. The use of different shapes across the three characters not only serves to visually differentiate them but also functions as part of the character communication strategy, allowing their respective personalities and roles to be more easily recognized by the target audience. Thus, the application of shape psychology contributes to establishing the characters' visual identities while supporting the delivery of educational messages within the interactive illustrated book. The combination of socially realistic figures and imaginative visual elements is expected to make information regarding diarrhea prevention and Clean and Healthy Living Behaviors (PHBS) more engaging while maintaining its relevance to children's everyday experiences. At this developmental stage, children also begin to acquire and understand basic knowledge about health and personal hygiene that can be applied in their daily lives. This is relevant to the learning materials for fifth-grade elementary school students, who begin to study the human digestive system through the Natural and Social Sciences (IPAS) subject, including the structure and function of the digestive system and efforts to maintain digestive health (Dewi, 2023).

Through an interview with Anie Widiastuti, a Natural and Social Sciences (IPAS) teacher, it was found that textbooks or BOS Books remain one of the media used by children to obtain information regarding diarrhea prevention. However, educational textbooks generally present learning materials through extensive use of written text and explanations, while illustrations, visual elements, and engaging activities remain limited. This condition may make the delivery of health-related information less engaging for children aged 10–11 years, particularly when the materials are factual in nature and require gradual comprehension.

According to Morrison (2013), books that incorporate interactive elements can stimulate children's creativity and imagination while increasing their engagement in the reading process. Septyaningsih (2024) also stated that an environment enriched with a variety of engaging reading materials can support children's literacy development. In addition, pop-up books incorporate three-dimensional elements that create movement and more engaging visualizations, thereby increasing children's curiosity about the presented material. Other advantages include activities such as sliding, opening, and folding pages, which allow children to become directly involved in the reading process (Setiyanigrum, 2020). This is consistent with an interview with Herry Prihamdani, a children's book illustrator, who stated that interactive illustrated books can increase children's curiosity about the presented material and assist them in receiving information, particularly factual knowledge. Therefore, educational media for diarrhea prevention that relies predominantly on text-based information and limited visual elements may provide limited opportunities for engaging and active learning experiences. This condition indicates a need for alternative educational media that integrates information, illustrations, and interactive elements so that

information on diarrhea prevention through Clean and Healthy Living Behaviors (PHBS) can be delivered in a more engaging and comprehensible manner while remaining appropriate for the characteristics of children aged 10–11 years.

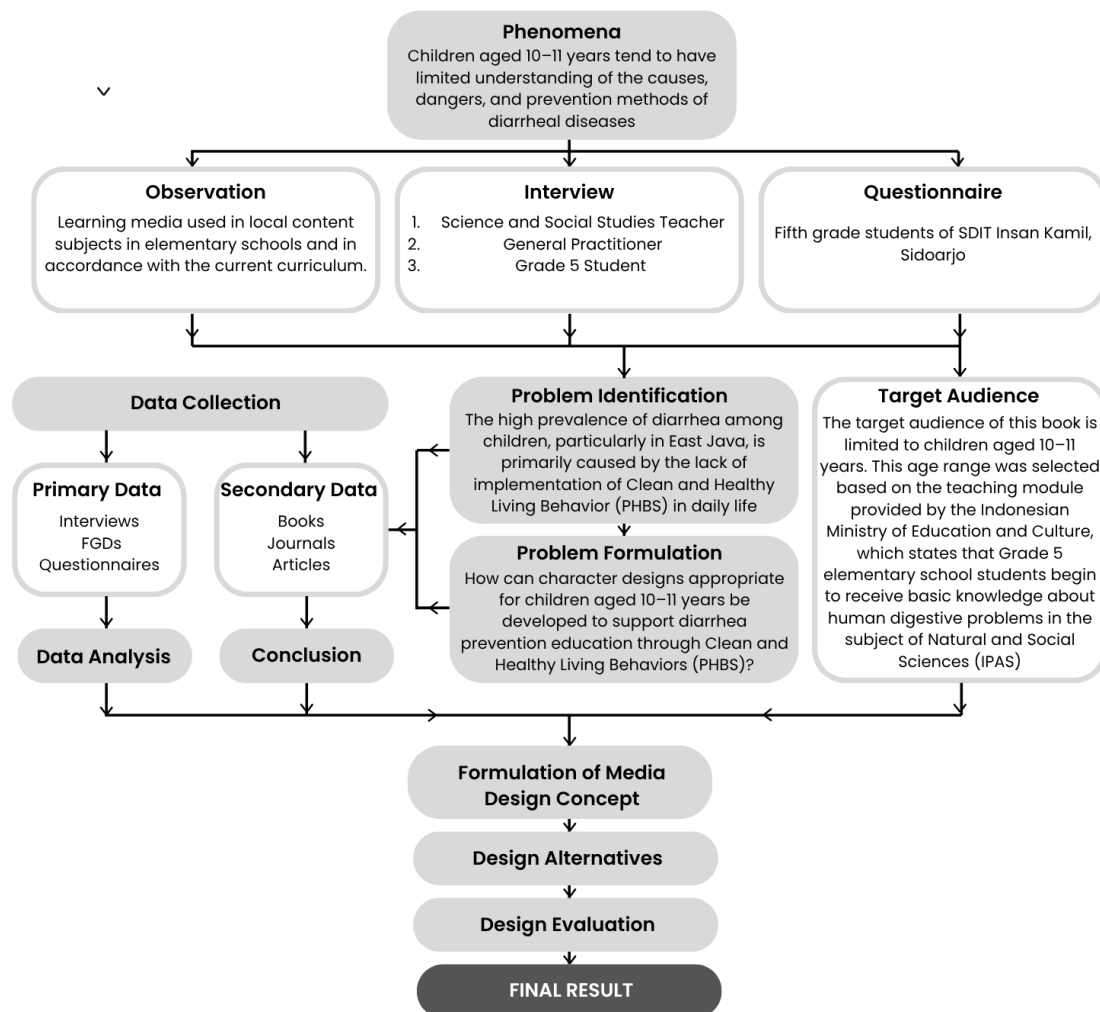
Character design for an interactive illustrated book on diarrhea prevention for children aged 10–11 years is the main focus of this article. Character design encompasses various aspects, including the appearance, personality, behavior, and distinctive characteristics of the characters being developed. In general, children tend to be attracted to colorful visual styles with simple forms that are easy to understand and visually appealing. In addition, distinctive elements associated with children's everyday world are incorporated into the character designs (Hermanudin & Rahmadhani, 2019).

Based on the background discussed above, the research problem is formulated as follows: "How can character designs appropriate for the characteristics of children aged 10–11 years be developed as part of an educational medium for diarrhea prevention through Clean and Healthy Living Behaviors (PHBS)?" This design aims to develop character designs that are appropriate for children aged 10–11 years in order to attract their attention and facilitate their understanding of the educational content presented in the interactive illustrated book on diarrhea prevention.

The research approach employed in this design process is a mixed-method approach, which combines qualitative and quantitative approaches to obtain data that are more valid, reliable, comprehensive, and objective (Hendrayadi et al., 2023). This approach was used to collect the data required for the development of the interactive illustrated book as an educational medium for diarrhea prevention and the implementation of PHBS among children aged 10–11 years. Primary qualitative data were collected through interviews with various sources and focus group discussions (FGDs). Meanwhile, quantitative data were obtained through questionnaires distributed at an elementary school. To support and strengthen the collected data, secondary data were also obtained through literature studies of various sources, including journals, articles, online news portals, books, and previous studies.

The data obtained through the mixed-method approach were subsequently used as a basis for determining the needs and visual characteristics of the target audience in the design process. To systematically translate the research findings into a visual solution, the character design process employed the Design Thinking method. This method was selected because character design requires an understanding of the needs, characteristics, and visual preferences of the target audience before determining the appropriate concepts and visual forms. Thus, the mixed-method approach served as the research approach for collecting and analyzing data, while Design Thinking was employed as the design method to transform the research findings into a character design solution appropriate for children aged 10–11 years.

The following is the design framework used in the development of the interactive illustrated book on diarrhea prevention for children aged 10–11 years:



Picture 1. Design Framework

Existing studies and comparator studies constitute the next stage of the design process. Existing studies serve as references and foundations for developing ideas, ensuring that the resulting design does not replicate existing works. Meanwhile, comparator studies serve as a basis for comparison to identify the strengths, weaknesses, and differences between the proposed design and existing works. The existing studies used in this design process were the Waspada Diare poster from Pusura Candi Clinic and the PHBS poster from SDN Baratajaya Surabaya. The comparators included Pengetahuan Paling Jorok di Dunia by Yim Sook Young and Ki I Rang (2009), which contains information about diarrhea and employs a unique illustration approach. Another comparator was Ensiklopedia Lift the Flap Antariksa by Marnie Willow (2022), which utilizes interactive features to present factual information, making the material more engaging to read.

Character design is a creative process of depicting or visualizing a character or entity within a story, which may take the form of a human, animal, object, or fictional creature. This process involves various essential elements, including physical appearance, personality, clothing, facial expressions, and character behavior, all of which are designed to create a character that is not only visually appealing but also distinctive and meaningful. Character design should also be relevant to the context of the story so that it can support and strengthen

the narrative being conveyed (Ruyattman, 2013). The character design process begins with the development of an initial concept, which includes basic ideas regarding the character's identity, role in the story, and interactions with the surrounding environment. The concept is then developed into sketches and more refined visual designs, incorporating details such as color, texture, and form that support the character's characteristics. In the final stage, the refined character design can be applied to various media or formats, including illustrations, animation, and other products, with the purpose of effectively communicating the story's message or theme through character visualization (Aroisi & Kurniawan, 2023).

The character design process was subsequently carried out using the five stages of Design Thinking, namely empathize, define, ideate, prototype, and test. In the empathize stage, the designer identifies and understands the characteristics, needs, and preferences of children aged 10–11 years as the target audience based on data obtained through observation, interviews, focus group discussions (FGDs), questionnaires, and literature studies. The define stage involves identifying and formulating the design problem based on the analysis of the collected data, particularly the need for characters that can represent the target audience while supporting the delivery of information on diarrhea prevention through PHBS in an engaging and communicative manner. The ideate stage involves developing character concepts and several design alternatives based on the analysis of the target audience. At this stage, three main characters were developed: Ola as a representation of children aged 10–11 years, Bu Vero as a teacher and educator, and Super Bu Vero as a character combining educational and imaginative elements. The prototype stage involves visualizing the concepts into several design alternatives through sketching and developing the characters' body shapes, facial features, clothing, expressions, colors, and visual attributes. The developed alternatives then proceed to the test stage through a validation process to assess the respondents' responses, preferences, and the suitability of the designs to the characteristics of the target audience. The validation results are subsequently used as a basis for evaluating and refining the design alternatives until the final character designs that meet the objectives of the design process are obtained.

DISCUSSION

1. Character Design Concept

The initial step in the character design process was the development of the design concept. The concept was derived from research findings and data analysis, which were subsequently processed and adapted to the characteristics of children aged 10–11 years. The design process consists of two main concepts, namely the verbal concept and the visual concept. The following sections describe each concept in detail:

a. Verbal Concept

1. Ola's Character

Ola is the main character, designed to be within the same age range as the target audience, namely fifth-grade elementary school children aged 10–11 years. This allows the character to serve as a point of identification and representation for children as they follow the storyline. Ola is depicted as a girl with a simple body shape, wearing glasses, and having a cheerful personality to create a visual impression that is appropriate for school-aged children, as well as being friendly and approachable. Ola is cheerful, highly curious, and enjoys asking questions. The selection of these characteristics serves a narrative function by connecting children's natural curiosity with the educational information about diarrhea prevention conveyed throughout the story. This approach allows information regarding Clean

and Healthy Living Behaviors (PHBS) to be delivered through a more natural process of exploration.

2. Bu Vero's Character

Bu Vero is the second character, portrayed as a teacher. The teaching profession represents one of the figures who is closest to children's lives within the school environment and serves as a source of knowledge and guidance throughout the learning process. Bu Vero is depicted as a female teacher aged 25–30 years with a moderately proportioned body shape to create a simple, friendly, and realistic impression, making her easily recognizable and approachable as an educator. Her caring, gentle, and attentive personality is intended to establish a positive emotional connection with Ola while creating a sense of safety when delivering health-related information. Therefore, Bu Vero functions not only as a supporting character but also as an educational figure who helps explain information about the causes and prevention of diarrhea through Clean and Healthy Living Behaviors (PHBS) using language that is easy for children to understand.

3. Super Bu Vero's Character

Super Bu Vero is a visual transformation of the Bu Vero character, introduced to provide visual variation and increase the appeal of educational content. Through a superhero-inspired costume, Super Bu Vero creates the impression of a character with special abilities, enthusiasm, and the capacity to provide solutions to problems encountered throughout the story. The transformation of Bu Vero into a smaller, costumed character serves as a visual approach to representing bacteria that cannot be seen by the naked eye, while also providing a distinctive visual feature that can be easily recognized by children and creating a more dynamic and enjoyable impression. Super Bu Vero is portrayed as an enthusiastic and knowledgeable figure who represents an educational character capable of delivering information about diarrhea prevention in a lighter and more engaging manner. This visual transformation is also intended to reduce the formal impression associated with educational content, allowing information about PHBS to be more easily received and understood by children aged 10–11 years.

b. Visual Concept

1. Color

The colors used in the illustrations of this book are vibrant and cheerful, while also being adapted to the story's energetic and mysterious atmosphere to attract the attention of children aged 10–11 years. The following is the color palette used in the design:



Picture 2. Color Palette

2. Illustration

In the book *Panduan Mengilustrasi dan Mendesain Cerita Anak untuk Profesional*, Ghozalli (2020) states that the term illustration originates from the Latin word *illustro*, which refers to the act of illuminating or clarifying. Illustration can generally be understood as a form of graphic representation, and some forms of graphics can also be categorized as illustrations. In broad terms, illustration can be defined as an image that contains content or conveys a story. In children's storybooks, illustrations play an important role and may have a greater visual role than the written narrative. In this design, human figures are used as the basis for the character illustrations, as they are considered easier for children to understand and relate to their everyday experiences, particularly within the school environment.

3. Illustration Style

The illustration style used in the character design adapts a textured digital illustration style inspired by Rizkia Gita. To create a distinctive visual identity and differentiate the design from the reference style, this approach is combined with the illustration style developed by Zakkiya Fauzia.



Picture 3. Illustration Style of Zakkiya Fauzia and Rizkia Gita

2. Character Design Alternatives

The character design alternatives were developed after establishing the verbal and visual concepts, as well as a moodboard that aligned with the storyline. Three different design alternatives were developed for each character to explore various visual possibilities and determine the design that best represented the intended characteristics and roles. The following sections present the design alternatives for Ola, Bu Vero, and Super Bu Vero:

a. Ola

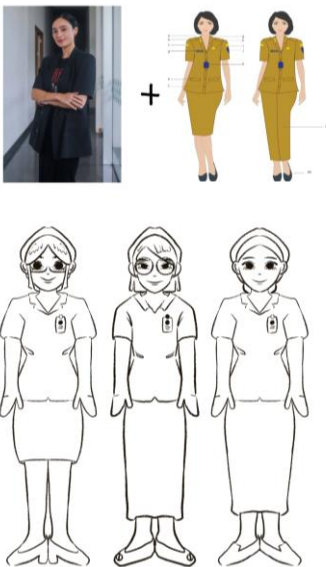


Picture 4. Moodboard for Ola Character



Picture 5. Character Design Alternatives for Ola

b. Bu Vero

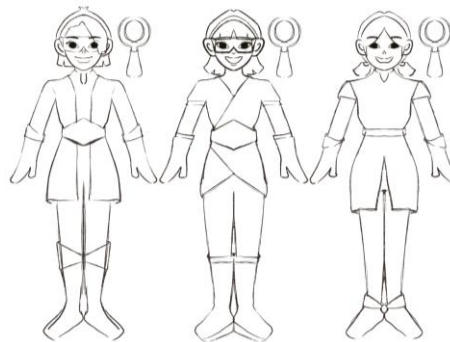


Picture 6. Moodboard for Bu Vero Character



Picture 7. Character Design Alternatives for Bu Vero

c. Super Bu Vero Character



Picture 8. Moodboard for Super Bu Vero Character



Picture 9. Character Design Alternatives for Super Bu Vero Character

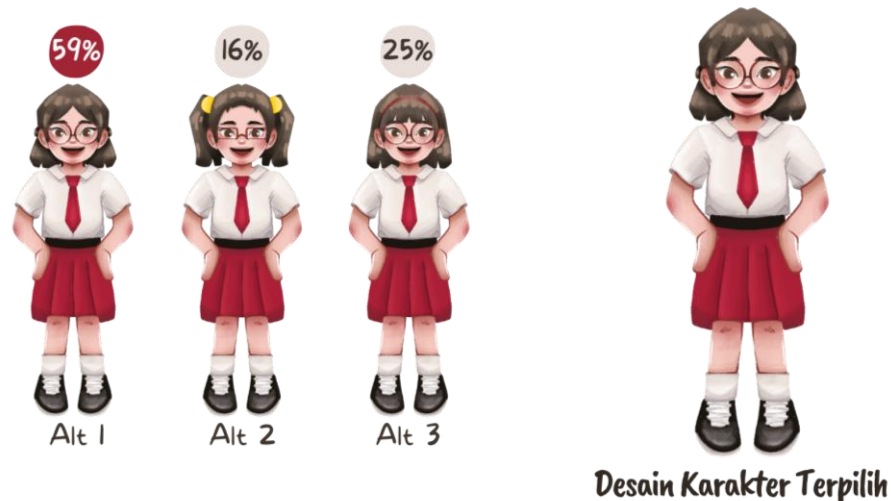
3. Final Character Design

The final character designs were selected from the three previously developed alternatives through a design validation process. The validation was conducted by distributing questionnaires both online via Google Forms and offline at SDIT Insan Kamil and SDN Kendalpecabean, targeting children aged 10–11 years. A total of 80

respondents participated in the questionnaire. The following presents the selected character designs based on the alternatives with the highest percentage of respondents' preferences:

a. Ola

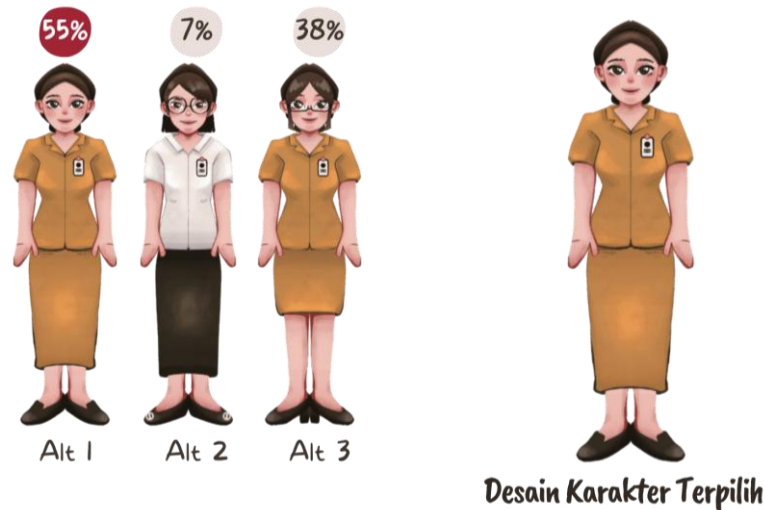
During the validation of the Ola character, Alternative 1 received 59% of the respondents' preferences, Alternative 2 received 16%, and Alternative 3 received 25%. Based on these results, Alternative 1 obtained the highest percentage and was therefore selected as the final design for the Ola character. Alternative 1 presents a female child character with a simple and easily recognizable visual style, featuring a simpler hairstyle compared to the other alternatives. This selection also supports Ola's role as a representation of children aged 10–11 years, as the visual design conveys a simple, cheerful, and relatable impression that reflects children's everyday lives. The validation results indicate that this alternative was more widely accepted by the respondents compared to the other alternatives and was therefore selected as the final design for the Ola character.



Picture 10. Final Character Design for Ola

b. Bu Vero

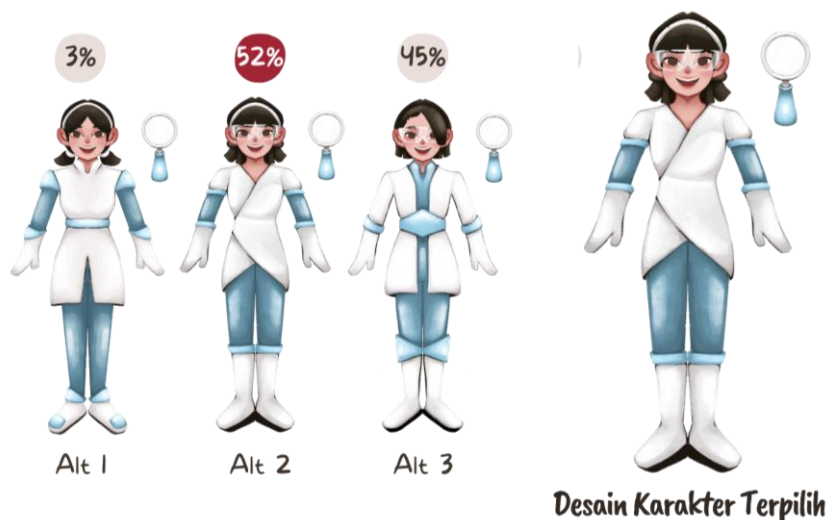
During the validation of the Bu Vero character, three design alternatives were presented, featuring variations in clothing, hairstyle, and overall visual appearance. Alternative 1 received 55% of the respondents' preferences, Alternative 2 received 7%, and Alternative 3 received 38%. Based on these results, Alternative 1 obtained the highest percentage and was therefore selected as the final design for the Bu Vero character. Alternative 1 features a brown outfit with a uniform-style design that creates a neat and orderly impression, consistent with Bu Vero's identity as a teacher. The visual design also maintains soft and simple characteristics, supporting her role as a caring and approachable educator. The high percentage of preference for Alternative 1 indicates that this visual design was considered more suitable to the respondents' preferences compared to the other alternatives.



Picture 11. Final Character Design for Bu Vero

c. Super Bu Vero Character

During the validation of the Super Bu Vero character, three design alternatives were presented, each differing in costume design and superhero visual elements. Alternative 1 received 3% of the respondents' preferences, Alternative 2 received 52%, and Alternative 3 received 45%. Based on these results, Alternative 2 obtained the highest percentage and was therefore selected as the final design for the Super Bu Vero character. Alternative 2 features a white and blue costume with a more defined structure, complemented by a magnifying glass as a supporting visual attribute. The selection of these colors and forms creates an impression of cleanliness, activeness, and dynamism, which corresponds to Super Bu Vero's role as a knowledgeable character who helps deliver information about diarrhea prevention. The 52% preference indicates that Alternative 2 was favored over the other two alternatives, although Alternative 3 also received a relatively high percentage of 45%.



Picture 12. Final Character Design for Super Bu Vero Character

4. Design Implementation

After completing the preceding stages, the final character designs were implemented across several media. One of these applications is the implementation of

the final character designs on the primary medium, namely the book cover, as presented below:



Picture 13. Design Implementation on the Book Cover

CONCLUSION

The character design for the Interactive Illustrated Book on Diarrhea Prevention as an Educational Medium for Clean and Healthy Living Behaviors (PHBS) for Children Aged 10–11 Years was developed as an effort to support the delivery of diarrhea prevention education, which requires visual media that are engaging, informative, and appropriate for the characteristics of the target audience. Based on observations and interviews, children's knowledge regarding the causes and risks of diarrhea was found to remain limited. Therefore, an educational medium is needed to present PHBS-related information in a contextual manner that is closely connected to children's everyday lives, particularly within the school environment. Accordingly, the character design was developed by considering the cognitive and visual characteristics of children aged 10–11 years through the use of figures that are familiar to their daily lives, combined with imaginative elements to enhance visual appeal and children's emotional engagement.

The characters developed consist of Ola, Bu Vero, and Super Bu Vero, each serving a different yet complementary function in delivering educational messages. Ola was designed as a representation of a school-aged child with a curious personality, allowing her to serve as a connection between the reader and the information presented. Bu Vero functions as a teacher who guides and provides information through a warm and approachable manner, while Super Bu Vero introduces an element of fantasy that enhances children's imagination, visual appeal, and engagement with the story. The three characters were designed using simple and expressive visual forms, vibrant colors, and textured illustration styles adapted to the visual characteristics of the target audience. Based on the validation results, the selected design alternatives were those that best matched the preferences of the target audience. Therefore, the resulting character designs function not only as visual elements within the book but also as part of the communication strategy to convey information about diarrhea prevention through PHBS in a more engaging, comprehensible, and enjoyable manner for children aged 10–11 years.

RECOMMENDATIONS

The character design developed in this study can be further expanded into various derivative educational media to broaden the reach of messages regarding diarrhea prevention and the implementation of Clean and Healthy Living Behaviors (PHBS) among children.

The characters Ola, Bu Vero, and Super Bu Vero can be adapted into media such as educational animations, interactive stickers, digital learning materials, and supplementary learning media for the school environment. Future developments should maintain the established visual characteristics and personalities of the characters to ensure consistency in their visual identity. In addition, further development may explore a wider range of interactive features and digital media to increase children's engagement in receiving information about PHBS and diarrhea prevention.

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