Environmental and hydroponics education for children through story book design

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Abstract. Children are need education regarding hydroponics and environment. The problems raised in this design are to how to design the appropriate eco-friendly story book media to introduce hydroponics and environmental issues such as climate change and its impact to agriculture. The purpose of this design is to create a picture story book as an effort to introduce hydroponics to children. The research method used was descriptive qualitative method with data collection techniques of questionnaire, literature study, and interviews. The media that is considered capable of providing a solution to this problem is a picture story book that contains information about introduction to hydroponics and environment issues with simple hydroponic planting procedures for children.

1. Introduction
Hydroponics is a new technique in planting technology. Hydroponic farming system can be utilized on limited land or even in small spaces around the house. Hydroponics is a method of agricultural cultivation without using soil media. It uses water as a medium to replace soil [1]. Currently, hydroponic cultivation is gaining popularity all over the world due to its efficient resources management and yield quality. The concept of hydroponic agriculture has different criteria and methods from conventional agriculture. There are many elements that need to be considered when applying hydroponics. This technique allows people to control the nutrient solution, which is the primary environment necessary for the growth of roots of the agricultural crops being developed [2]. Conventional agricultural practices cause a wide range of negative impacts on the environment. Rapid urbanization and industrialization also decrease the area of cultivable land [3].

Land area is decreasing due to the conversion into residential and industrial areas. On the other hand, the population continues to grow. In fact, the agricultural sector has a major influence in supporting food security. Therefore, the younger generation needs to be encouraged to become farmers so that Indonesia can meet the food demands in the future.

Hydroponics is an agricultural method that uses water or liquid that is rich in plant nutrition as planting media [4]. Hydroponic system places plant roots in direct contact with nutrients while getting enough oxygen to optimize plant growth [5]. With hydroponics, everyone can take advantage of limited space for farming. With hydroponics education, children so they can learn and practice hydroponic planting at home.

The effort to increase the interest of the younger generation in farming activities can be started early and in a simple way. One of them is by introducing children to hydroponic farming. To learn about
hydroponics, children need to know its process. In hydroponics, plant roots are either submerged in water or a film of nutrients mixed with water that is constantly encompassing the root zone. It keeps the plants hydrated and nourished. Hydroponics uses substantially less water as compared to the soil farming. The water is not wasted in hydroponic process because it gets recovered, filtered, replenished and recycled. Waste nutrient solution can be used as an alternate water resource for crop cultivation in hydroponic system [6]. The purpose of this study is to design the appropriate eco-friendly story book media to introduce children to hydroponics and environmental issues such as climate change that is related to agriculture. The story book contains information about hydroponics and environmental information with simple hydroponic planting procedures. The contents of the story book also explains that hydroponics can play a great contribution to areas with limited soil and water.

2. Methods
This study seeks to develop a story book to introduce hydroponic to children. This research was a descriptive qualitative study. The data were collected through several methods including site observation, in-depth interviews, and document study. The samples were selected using purposive sampling technique [7]. The data were analysed using interactive analysis model. The action taken was to use the research results as a prototype of an educational story book design about the concept of hydroponic.

3. Results and discussion
As the first step to introduce children to hydroponics, it is recommended to start by introducing the understanding, function and purpose of the hydroponic method. The main thing is to introduce that hydroponics uses nutrient water as the plant growing medium so that the planting process is not dirty. The process starts from preparing the seeds, maintenance, to harvest. The recommended seeds used for hydroponic practice at the introduction stage is green plant vegetables. In addition, flexible and fun delivery of the material is recommended. The material can be adapted into a story with a plot based on a daily story as an example of the case.

Hydroponic is a method for growing plants without using soil. Plants take the required mineral nutrients from nutrient solution dissolved in water [8]. The hydroponic system that is recommended as an initial practice for children is the Wick System. The Wick system has several advantages because it is simple, inexpensive, and easy to do, making it suitable for beginners to learn about hydroponics. In addition, the wick system can be made from used materials such as plastic bottles and the plants do not need to be watered every day. Children books usually contain knowledge that is new to them. This can be the reason why children will have difficulty with new vocabulary or pictures they have never seen before. This book about hydroponics requires parental assistance for mentoring and supervision, because there are various terms commonly used in agriculture. The book also has some hydroponic planting exercise needs that need to be done by the children. Such activity will also require adult’s supervision.

The language style for this picture story book is light yet informative, taking into account that the target audience of this book is elementary school children. The material in the book was also made easier for children to understand. Picture story is a form of unified story accompanied by pictures that serve as decoration and support for the story that can help the process of understanding. The choice of colours, layouts, and illustration styles is adjusted to the target audience. The main Media in the design of the illustration story book “Hydroponics: Farming without Soil” visually shows an illustrated characters of a child named Vivi and her grandfather. At the beginning, this book tells about Vivi’s experience in Grandpa's hydroponic garden. This finally made Vivi know about what hydroponics is. In the next section, there are practice exercises with parents on how to grow hydroponics at home using simple materials, such as used bottles. In this section, children are guided to simple hydroponic planting process, starting from sowing, transplanting seeds, to maintenance. The supporting or additional media in this design are hydroponic kits, posters, x-banners, tote bags, cloth masks, stickers, and social media advertisements.
The visual strategy of the hydroponic storybooks is a means of developing ideas and education for children. In addition, the visual strategies are the main method to achieve the target for the success of the hydroponic storybooks. Conformity with the target audience’s interest will encourage children to read and practice the information from the book (Figure 1). The design for the cover must be in accordance with the target audience, namely kids (Figure 2). The contents of the story book were designed attractively along with the explanatory text of each page (Figure 3, 4, 5). Equipped with the supporting media, namely posters (Figure 6), the hydroponic kits contain packaging designs for boxes, bottles and other equipment (Figure 7). The book is also equipped with other promotional media such as x-banners and stickers which could be used as merchandises (Figure 8 and 9). To support all of the book items, a social media was designed to introduce the programs in the hydroponic book stories to the whole community, especially kids (Figure 10).

![Figure 1. Visual strategy of hydroponic story book](image1)

![Figure 2. Design of storybook cover](image2)

![Figure 3. Picture storybook contents 01](image3)
Figure 4. Picture storybook contents 02

Figure 5. Picture storybook contents 03

Figure 6. Poster

Figure 7. Hydroponic kits

Figure 8. X-Banner

Figure 9. Sticker
4. Conclusion

After all stages were carried out in the study, it can be concluded that there are many aspects that must be considered in designing picture story books about hydroponics for children. Instilling interest in farming activities can be done from an early age. One of them is by using picture story books. Several parts of this book discuss the basic understanding of hydroponics such as its meaning, benefits, and procedures. The most important step in the making of this book is in-depth research to determine the right and appropriate information for children. To attract the target audience of this hydroponic story book, the children, a suitable illustration style must be used. Some of the illustration styles chosen were clear character shapes with contrast and bright colours. Other aspects to be considered are the readability of writing and appropriate layouts to make the book comfortable to read.

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