

CHAPTER 1 INTRODUCTION

1.1 Project Background

Children are always seen as the purest being in the world. Child (*t/airld*) is defined as a young human who is not yet an adult (Oxford, 2003). Children, who were just born, who have not yet reached the age of puberty, is considered as pure human beings as they do not know the good and bad, and they cannot commit any atrocities due to their under-developed brain in understanding the human society and its norm.

Simultaneously, as well as they are considered the purest among any human being, children are also considered as one of the most important aspects in the society. It is stated that children are already bound to a set of several informal relationships that will always evolve over the life span. It is also stated that children's personalities will always match with their surroundings, time, activities in which the children belong to. From the beginning, children have always affected by the resources, policies, and morality beyond their direct environment and neighbourhood. The easiest example is early care, where the children will be classified to a quality of early care based on the parental income, entitlements, local environment, and the availability of early years facilities which are all affected by the economy and government policies (Hendrick, 1997).

This research discusses the profound impact of education for children on economic growth, social mobility, cognitive development, health, civic responsibility, technological advancement, cultural preservation, and environmental sustainability. Education equips children with the skills and knowledge necessary to contribute to the workforce, leading to increased productivity and competitiveness at both individual and national levels. Furthermore, education is highlighted as a crucial tool for breaking the cycle of poverty and promoting social mobility, as it fosters cognitive development, critical thinking, and problem-solving skills. Additionally, educated individuals are more likely to make healthier life choices and engage in civic responsibility, contributing to overall well-being and active citizenship. Moreover, educations play a vital role in a country's ability

to compete effectively in international markets and maintain geopolitical influence. It drives innovation, technological advancement, and the preservation of cultural heritage while also fostering environmental consciousness and sustainable practices. Ultimately, education is presented as a key factor in promoting social justice and equality, making it essential for the continued development and well-being of individuals and societies.

This research also emphasizes the importance of educating children about the nature, ecosystems, and the environment, particularly in light of the growing global environmental challenges. It can be argued that educating children about nature is crucial for raising environmental awareness and promoting conservation and sustainable practices. Outdoor experiences are highlighted as a key method for fostering a love for the environment and understanding concepts such as biodiversity and the interconnectedness of species. This also highlights the benefits of nature education for children's psychological well-being, including stress reduction improved cognitive development, and increased physical well-being. Furthermore, it stresses the importance of equipping children with the knowledge and skills to implement nature-based solutions to address environmental challenges. Overall, the paper underscores the significance of nature and ecosystem education for children in building a strong ethical foundation for protecting natural resources and developing eco-literacy to make informed decisions in an increasingly environmentally challenging world.

The topic of educating children also comes with the four different learning styles used to teach children, which are: kinesthetics, visual, auditory, and reading/writing. Visual learners usually gain more information from using visual aids such as charts, diagrams, images, and videos, whilst auditory learners are studying by listening. Kinesthetic learners engage the most in doing hands-on activities and physical activities, meanwhile reading/writing learners learn best when they read and write in order to comprehend and retain information. However, because of their age and the underdeveloped prefrontal brain, which controls focus, children frequently have lower attention spans than adults. ADHD and other disorders can also impair a child's capacity for sustained attention. It is said that youngsters are more drawn to visual and auditory learning in order to address this. It may therefore be advantageous to design a learning environment that blends these two learning philosophies. This might be accomplished by using technology,

like augmented reality (AR), to give kids a more interesting and productive learning environment.

With the advancement of technology in this day and age, it is possible to create learning that is both visual and auditory. AR technology can be used to apply this knowledge. Technology integration, especially augmented reality (AR), has advanced quickly and has a big impact on a lot of different industries, like gaming, health care, education, and business (Bacca et al., 2014). By superimposing digital data and interactive components on the physical world, augmented reality has become a game-changing technology with enormous promise. The development itself may actually be traced back to the 1960s, when Ivan Sutherland's most useful work was built upon a foundation of head-mounted displays and computer-generated visuals. The application of AR in various fields has been shown to provide a number of benefits. For patient care, surgery, and medical training, healthcare selectors have embraced augmented reality (Zhu et al., 2014). In a different field, the game industry has used augmented reality to produce immersive and participatory gaming experiences, as *Pokemon Go* (Hamari et al., 2014). By increasing productivity and efficiency, augmented reality is also revolutionizing industries. Its implementation has been shown to streamline procedures. AR has replaced traditional teaching approaches in education with more engaging instruction. It improves involvement, makes abstract ideas more visually appealing, and fosters hands-on learning. This has shown to enhance memory retention and comprehension of a number of challenging subjects. Students can gain a deeper understanding of the subject matter than they would if they relied just on textbooks by using augmented reality as the teaching medium. Given the foregoing advantages of using augmented reality, it is therefore difficult to create an augmented reality-based system to teach kids about nature, particularly the different kinds of plants and animals that make up each ecosystem. On the other hand, it is a very feasible act, and the act of educating children through visual and aural means will help them develop their understanding of nature, leading to the creation of a society that is more environmentally conscious in the future.

1.2 Problem Statement

The problems that can be raised based on the background that has been texted above are:

1. The rarity of children knowing animals and plants species in several ecosystems due to the extinction and climate crisis. In this era, as the world undergoes extreme climate crisis and climate change, there are so many species that goes in the brink of extinction, or even extinct itself. In Indonesia, there are so many species that is already extinct and can only be identified by textbook, such as Harimau Bali (*Panthera tigris Balica*), Tikus Gua Flores (*Spealaeomys florensis*), and Burung Kuau Bergaris Ganad (*Argusianus bipunctatus*). This leads to the blindness of children to the species mentioned above. Frequently, when the children are asked this type of question, they cannot answer due to their limited knowledge of the animals and plants in various ecosystem.
2. The difficulties of children having lesson in text book due their low span attention. As mentioned in the background, children tend to have lower attention focus than adults due to their development of frontal brain. This leads to the problem in educating children about nature, especially educating them regarding nature or ecosystem. Children do not like the teaching about extinction species by only relying on textbook. Roughly, it is proven that the teaching by only textbook bore them, thus creating them not paying attention to the materials given by the teachers.
3. The rarity of AR-based system to teach and educate children about nature and ecosystems. With the difficulties of children in paying attention to a textbook, a visual learning system based on augmented reality should be implemented to children. However, in Indonesia itself, the augmented reality-based system created to teach children is rarely found. Even when it is found, the usage of the system itself can be counted less than ten times, due to the high maintenance and the unfamiliarity of the citizen to the implementation of augmented reality in education.

1.3 Aim and Objectives

The aim of this project is to:

1. To study and implement augmented reality-based system for teaching children about nature and ecosystem of the world.
2. To create a system based on augmented reality to educate children about nature and ecosystem.

3. To further develop the education system and method of teaching children in the future, where children can learn a subject based on augmented reality system and not only relying on textbook.

The objectives of this project are:

1. To develop a function that utilizes the visual and auditory learning system in term of introducing children to nature.
2. To develop a function that utilizes the implementation of Augmented Reality which allows users to see and interact with virtual objects and information in real world.
3. To create a feature of interactive learning experiences, so that from the students and teachers can are enable to engage with the content of the augmented reality based-system.

1.4 Significances

Augmented reality (AR) authorized an interactive experience with the real world where all objects are enhanced by computer-generated perceptual information. Using this subject to education will bring several significances, such as enhanced engagement, personalized learning, real-world application, and many more.

Enhanced engagement in using augmented reality for education is brought using the fact that children have much lower attention span than adults. By creating a system that is full of visual and auditory attraction to children will surely make them interacts more with the learning. It leverages their natural curiosity and fascination with the developed technology, motivating them to explore and interact with educational content actively.

Augmented reality-based system can also adapt to individual learning styles and paces, providing personalized content and feedback. It allows children to progress at their own speed and receive content tailored to their abilities and interests. For example, student A has the capability of learning two materials a day, meanwhile student B has the capability of learning only a material a day. The augmented-reality based system can adapt to both of these students, so that student A will be given time to learn two materials a day, and student B will be given to study a material a day.

It also enables children to see the practical application of what they have learnt. By overlaying all the digital information into real world objects or environments, it helps children connect theoretical knowledge to the real-life situations. The example given is when augmented-reality system can give the student question that is very related to real life, such as “There is a trash outside the can? What should we do?”. The simple question related to real-life can give more enhancement memory to the children to practice it on their daily lives, creating a more environment aware children in the future.

Augmented reality-based system also supports collaborative learning, where children can work together on projects or solve problem using shared AR experiences. This can promote the skill of teamwork and leadership. Additionally, it also can provide accessibility features for children with diverse needs, such as those with disabilities, where it can offer content in multiple formats, including text, audio, and visuals, making it more inclusive.

1.5 Scopes

1.5.1 Project Scope

The scopes included in this project are:

1. Curriculum integration. This project integrates the education of the nature with the help of augmented-reality based system. By crossing the information of the virtual world, based on the textbook, into the real-world, it can integrate the curriculum of both technology subject and the biology, even geography subject.
2. Ecology. As the projects teach to children about the nature and ecosystem, it includes the scope of ecology. It introduces children to the concepts of ecosystem, biodiversity, and the interdependence of living organisms in nature. Since augmented reality also brings the environment to life, it can help children understand the beauty and the fragility of ecosystems. It can also explain ecological processes, like photosynthesis, the water cycle, and the nutrient cycling using AR animations and simulations.
3. Environmental stewardship. The system will develop the content that raise awareness about environmental issues, such as pollution, deforestation, climate change, and habitat loss. The usage of the augmented reality can visually illustrate the consequences of these issues and explain their impact on ecosystems, wildlife, and communities.

1.5.2 System Scope

As the project scopes are discussed above, the system scopes are also discussed below:

1. Computer vision and recognition. AR systems depend on computer vision algorithms to recognize and understand the real-world environment. It can utilize the computer vision and recognition to allow children identify plant and animal species in real-time. It also enables augmented reality application to recognize and display the behaviour and interactions of species in their natural habitats. Children can also explore the various ecosystems by the created environment of augmented reality.
2. User interfaces and interaction. Augmented-reality, as it named, based on reality, relies on intuitive and natural user interfaces for interaction. This includes gesture, voice commands, and haptic feedback. The augmented reality can be designed into a children-friendly design, where it can create an intuitive and visually appealing user interface specifically designed for children's cognitive and motor skills.
3. Content creation and development. Augmented reality-based system involves 3D modelling, animation, and the integration of digital assets into the real world. The tools and workflows for creating engaging AR experiences are being talked in this scope.
4. Sensors and tracking. Augmented-reality based systems usually use a variety of sensors, such as GPS, gyroscopes, and accelerometers to track the user's position and movements accurately.

1.6 Assumption and Limitation

1.6.1 Assumption

There are several assumptions that can be made through this project, which are:

1. Engagement and motivation, where the augmented reality is assumed to increase student engagement and motivation. It leverages interactive and immersive experiences, making learning more fun and compelling.
2. Enhanced learning, augmented reality is assumed to enhance the learning process by providing student with visual, interactive, and hands-on experiences that can improve comprehension and retention.

3. Accessibility, where augmented reality is accessible to students with various learning styles, especially with visual and auditory learning style, as it can present information in multiple formats and adapt to individual needs.
4. Personalized Learning, where the augmented-reality based system is expected to support personalized learning experiences by allowing students to progress at their own pace and receive personalized content to maximum the student's potential in learning the subject.
5. Real-World Context, in which augmented reality is assumed to help students connect the theoretical knowledge to real-world applications by overlaying digital information onto physical objects or environments.

1.6.2 Limitation

Limitations are factors that might affect the results or findings and are usually out of the researcher's control, which are:

1. Technology requirements, in which the AR is always requiring a smartphone or tablet, which not all children may have access to.
2. User Experience, which means that AR applications can sometimes be difficult to navigate, especially for young children.
3. Content creation, which means that the time and cost consume in creating high quality AR content might be a lot. It is important to ensure that the content is educational and engaging.
4. Safety, which means that AR could potentially bring dangers to children if not issued well, as it involves with the real-world interactions.
5. Internet connectivity, in which AR applications often require a stable internet connection to work properly, which might not be available in any places.

1.7 Chapter Summary

In conclusion, this chapter talks about the base of the project with the title "ArEco: Children's Education System to Recognize Animals and Plants' Patterns and Behaviours in Various Ecosystem Using Augmented Reality (AR)". The line that can be drawn is that this project is supported by the idea of creating an augmented-reality system for teaching and educating children about nature. As stated, the main research issue listed in this project is the difficulties of children learning about the ecosystems due to climate crisis, where several of plants and

animals' species wiped out before the children were born to know it. This project aims to introduce and educate this matter to children to create a society who understand the environment of the nature. This chapter also talks about the scopes, the objectives, and the significance of the project, where all three aspects are connected among each other. The objective of the research is to create the function, the system of an augmented-reality based system which can educate the children to understand more about the nature, the species, and the ecosystem of the world. This leads to the scopes of the project being three main scopes, one of them being ecology. The objective also leads the project to have the significance related to the usage of AR in educating nature to children, where it can increase more understanding by increasing learning experience through the augmented reality-based system.