



CATHARSIS 13 (2) 2024
165-172

p-ISSN 2252-6900 I e-ISSN 2502-4531



Catharsis: Journal of Arts Education

<http://journal.unnes.ac.id/sju/index.php/chatarsis>

Improving Early Childhood Literacy Abilities Through Digital 3d With Augmented Reality Technology

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Received 26 August 2024, Accepted 16 October 2024, Published 30 November 2024

Abstract

This research aims to discuss the results of developing 3D digital teaching media with augmented reality for children's literacy. Children can access AR Teaching Media independently. The method in this study uses a four-D design, namely define designed to analyze teachers' abilities in the context of Teaching Media to what extent teachers understand digital-based Teaching Media. Design is designing digital-based learning media software, namely 3D Teaching Media with AR technology, researchers will construct literacy materials in digital Teaching Media designs that are in accordance with literacy materials for early childhood. Develop is a stage that includes expert validation tests and feasibility of the initial design of Teaching Media and is then developed according to the direction of expert validation tests and feasibility tests. Dissemination is a stage to disseminate and implement Teaching Media products. The results of this study are the development of digital 3D-based teaching media with AR technology has been proven effective in improving early childhood literacy skills. The use of AR technology not only improves literacy skills, but also children's motivation and involvement in the learning process. With wider adoption and support for technology access and training for educators, AR-based teaching media can be a very useful tool for developing literacy in early childhood.

Keywords: Augmented Reality; Early Childhood; Literacy; Teaching Media; 3Dimensions.

INTRODUCTION

Early Childhood Education is a form of education that aims to support the growth and development of children as a whole. This program emphasizes the development of various aspects of a child's personality, so that they can grow optimally, (Tubaus Rahman, 2020). Early childhood is a very important period of human development. Education is very necessary for early childhood in order to foster character education by instilling character values in students, the components of which are knowledge, awareness or willingness and actions to be able to carry out, (Saputra et al., n.d.). At this point, children acquire basic skills that will help them learn later in life and learn about their environment. Literacy, which includes the ability to read, write, and understand text, is a very important skill to develop in early childhood. Literacy serves as the foundation for children's cognitive and academic development at later levels. Early childhood education is a field that greatly requires the use of learning media, (Rahmatika et al., 2023). Learning media that also functions as a means of guidance is an important tool in clarifying the message that the teacher wants to convey to students. Therefore, the use of innovative learning media should be designed to be fun and able to attract students' interest in learning, (Andriani & Ramadani, 2022). Products in the form of card media can be used to develop children's abilities and are declared suitable for use as teaching materials to improve the cognitive abilities of early childhood, (Wulandari et al., 2022). But developing early childhood literacy is increasingly difficult. With the advancement of technology, traditional literacy education methods are starting to be considered uninteresting to children. As a result, in order for the learning process to be more fun and effective, teaching media must be more interesting and interactive. The development of 3D digital-based teaching media supported by

Augmented Reality (AR) technology is one of the advances that can be utilized.

Augmented Reality (AR) is a technology that combines the real world with virtual elements generated by a computer in real time. Augmented Reality (AR) has the ability to display virtual objects into the real world in real-time. This technology allows interaction with three-dimensional objects, which enhances the learning experience. With the support of mobile devices equipped with high-quality cameras and various sensors, the learning potential for early childhood is even greater. The use of augmented reality-based learning media can make the learning process more interesting and help children better understand the material presented by teachers, (Sutresna et al., 2020). This technology allows users to interact with digital objects placed in a real-world environment. Augmented reality-based learning media allows children to interact with others continuously. AR technology and 3D digital-based learning media have enormous potential for literacy learning. Children can easily learn letters, numbers, words, and other basic concepts with more interesting visual elements. Through learning experiences that involve the senses of hearing, sight, and movement, this learning media not only improves children's literacy skills but also enhances their imagination, creativity, and motor skills. The prototype of the Augmented Reality (AR) system or application is designed to create an interactive learning experience for children. This application can be used to introduce various types of animals and fruits, both in educational institutions and as a support for independent education for parents, (Atmajaya, 2017).

The use of AR technology when teaching early childhood can also help teachers create more dynamic and effective classes. Teachers can use this media to help children understand more complex concepts more easily. Therefore, the development of 3D digital-based teaching media equipped with AR

technology is an innovative step that has the capacity to improve the quality of learning and accelerate literacy mastery in early childhood. Teaching Media is a basic thing that must be owned by every educational unit. Every educator is required to have Teaching Media as a reference in teaching.

The availability of Teaching Media in each educational unit is regulated in the content standards and educational process standards (Nuryasana & Desiningrum, 2020). Integrating technology, computers and the internet into the learning process is an effective step to increase the success of the teaching and learning process, (Lemeshchenko-Lagoda et al., 2020). Technology is integrated into learning to facilitate the optimal delivery of information. One of the topics that is currently being hotly discussed is literacy. The many studies on literacy illustrate how important literacy skills are. Therefore, literacy needs to be developed from an early age, because early childhood is an individual figure who is experiencing a rapid and fundamental development process for later life, (Patmonodewo, 2000). Therefore, literacy is one of the developmental tasks of children that must be stimulated from an early age, (Rizki et al., 2023). Literacy skills in early childhood are closely related to language and communication skills, (Basyiroh, 2017). The problem is that Indonesia is currently in a literacy culture crisis, (Nirmala, 2022).

The results of the 2012 BPS survey showed that only 17.66% of Indonesian children have an interest in reading. Furthermore, data on community literacy activities in Aceh province obtained an index value of 34.37 in the low category, (Kemendikbud, 2019).

The development of children's literacy skills should develop along with the development of the times, this encourages the need to use technology as a teaching medium to improve the literacy skills of early childhood. The solution to the success of literacy learning can be influenced by the integration of technology as a teaching medium. The learning process by involving children directly in the

environment can provide a more meaningful understanding because children are directly involved in real, (Ardianti et al., 2019). However, being directly involved does not mean having to jump in directly, because now there is a lot of technology that can depict objects like real forms by showing the real world context in the virtual world, namely Augmented Reality, (Vivianti & Ratnawati, 2021).

Augmented Reality (AR) is a technology that is a computer-generated technology that integrates 2 or 3-dimensional objects together with the time that is happening around the user in real time, (Ismayani, 2020). AR is one of the fastest developing technologies and is visible in our daily lives, (Alyousify & Mstafa, 2022). Early literacy does not mean being taught to read directly but rather making children love reading and building a foundation for reading first, (Harrington et al., 2015). Activities that can be done include telling stories, looking at letter and word symbols, as well as asking questions and playing letter tree games, (Lutfina et al., 2020) as well as picture story activities, (Nurhadijah et al., 2021). So in this study, researchers designed Augmented Reality technology-based Teaching Media in accordance with literacy materials for early childhood that are more fun and interesting. The development of AR-based teaching media is expected to improve early childhood literacy skills in a fun and effective way. This technology-based learning is also expected to improve children's literacy skills and prepare them for an increasingly digital world in the future.

The formulation of the problem to be studied is how the Development of Digital 3D-Based Teaching Media with Augmented Reality Technology in Improving Early Childhood Literacy Skills. The urgency of this study is that the use of AR is believed to be a good step to improve low literacy skills in Indonesia because of its attractive appearance, especially for early childhood. The use of AR can also provide a more meaningful learning experience for children because children can

see objects as if they were real as if they were facing each other directly. AR media can provide an interesting and enjoyable experience with the integration of virtual objects and additional information into real objects, (Zhu et al., 2017).

METHODS

The methodology of this study uses a research and development (R&D) approach. The ADDIE model, which stands for analysis, design, development, implementation, and evaluation, is a design commonly used in the development of learning media, (Kuantitatif, 2016). This study uses an approach in this study, namely a qualitative and quantitative approach. The qualitative approach determines and explores the needs, preferences, and responses of children to the use of augmented reality (AR)-based teaching media. Meanwhile, the quantitative approach uses valid and reliable measurement instruments to measure how well AR-based teaching media improves early childhood literacy skills. The research was carried out from early July to the end of July 2024. It was carried out in Simpang Mamplam District, Bireuen Regency. Precisely at the Aneuk Dayah Simpang Mamplam Kindergarten school. The purposive sampling method was used to collect research samples, involving children in the age range of 5 to 6 years who are suitable for the development of basic literacy skills. In addition, parents and teachers of children will be involved in assessing the use of AR-based teaching media. Instruments used Literacy tests, observations and questionnaires.

RESULTS AND DISCUSSION

Improving Children's Literacy Skills

Development of Animal Introduction Learning Media can help increase children's interest in learning to identify types of animals according to their groups easily using augmented reality applications, (Makapedua et al., 2021). Dickens AR, Animal AR 3D

application can be used as a medium for introducing animal names in English to early childhood. This can increase focus on vocabulary recognition in children, (Puspitadewi et al., 2021). To measure the effectiveness of AR-based teaching media in improving early childhood literacy skills, literacy tests were conducted before and after the use of teaching media. This test covers several aspects, such as:

- Letter Recognition: Children are asked to recognize and name letters displayed on the screen, both in 2D and 3D.
- Reading Simple Words: Children are asked to read simple words that appear in the AR learning media.
- Writing Words: Children are asked to write words that they have learned through the learning media.

Before using AR-based teaching media, the average literacy ability of children in letter recognition was 60%, and after using teaching media, the increase reached 85%.

- For the ability to read simple words, the average score before using teaching media was 58%, and after use, it increased to 80%.

- The word writing test showed an increase from 55% to 78% after using AR-based teaching media.

Significant improvements were seen in all aspects of literacy tested, with post-use test results being much higher compared to scores before using AR-based teaching media.

Observation and Feedback

Learning media in the form of story books based on Augmented Reality is suitable for early childhood. This learning media can be used to accommodate early childhood students in developing their reading skills through story books, (Novia et al., 2023). Therefore, qualitative data collection was conducted through direct observation of children during learning using AR-based teaching media, as well as interviews with teachers and parents regarding their responses to the use of technology in literacy learning.

- **Child Engagement:** Children appear very enthusiastic and engaged in learning. They enjoy interacting with 3D objects and appear more focused during learning sessions compared to conventional learning. Interaction with AR-based learning media encourages them to be more active in learning literacy materials.

- **Interest and Motivation:** Children show increased interest in learning. They prefer to use AR-based learning media compared to traditional textbooks. This can be seen from their happy reactions when they see letters or words appear in 3D and can be interacted with directly.



Figure 1. Research activities

Teacher and Parent Activities:

Augmented reality can improve children's morale after using augmented reality media higher than before using augmented reality media, (Sundari & Margaretha, 2023). In other words, the Augmented Reality Application becomes a media to guide prayer and can build the character of early childhood by learning prayer movements using a smartphone, (Adjis et al., 2021). Augmented reality-based learning media and an increase in teacher knowledge and understanding after conducting a trial of an augmented reality-based curriculum on the research subjects that have been conducted, there is a significant increase in teacher knowledge between before and after participating in the trial of the augmented reality-based curriculum model, (Nasution et al., 2022). From this it was found:

- **Teachers:** Teachers reported that AR-based learning media made literacy learning more interesting and fun for children. They felt that AR could clarify literacy concepts that were difficult to understand with conventional methods.

- **Parents:** Parents expressed that their children were more interested in reading and writing after using AR-based learning media. They reported positive changes in children's learning habits at home.

From the results of the study by referring to previous studies, it was found that teachers and parents of students found positive changes from the use of AR learning media. Thus, the learning media is able to educate children's characters to be better according to the development of the child's age.

Analysis of the Effectiveness of AR-Based Teaching Media

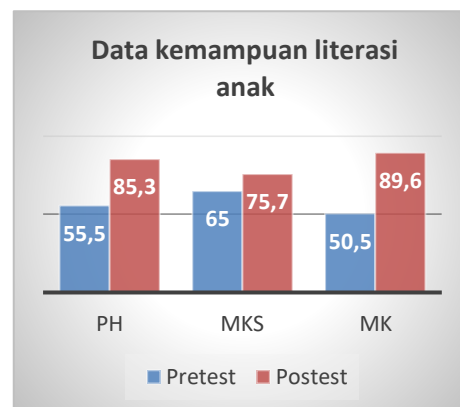


Figure 2. Statistic data

Providing learning using flashcard media influences children's ability to recognize letters, (Andini, 2022). Augmented Reality technology plays a very important role in developing creativity in children because it can attract and increase children's interest in learning and increase their creative imagination, (Puspawati & Suyadi, 2022). Digital 3D-based AR technology teaching media has proven effective in improving early childhood literacy skills. Significant improvements in the ability to recognize letters, read simple words, and write

words indicate that AR technology can support literacy teaching in a more interesting and interactive way. In addition, qualitative observations also show that AR-based teaching media can increase children's engagement and motivation in learning, which in turn accelerates the mastery of basic literacy skills.

CONCLUSION

The development of digital 3D-based teaching media with Augmented Reality technology has proven effective in improving early childhood literacy skills. The use of AR technology not only improves literacy skills, but also increases children's motivation and involvement in the learning process. With wider implementation and support for technology access and training for educators, AR-based teaching media can be a very useful tool for developing literacy in early childhood. With the existence of AR-based teaching media, in the future teachers will be able to fill learning in an interesting, creative and innovative way in accordance with the development of the times.

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