Education Policy and Development, Vol. 1 No. 2 (2023) https://doi.org/10.31098/epd.v1i2.1544

Research Paper

Innovation to Learn to Identify Animals with The Storytelling Method Using an Illustrated Flashcard Based on Augmented Reality

Denik Ristya Rini[1]*, Agnisa Maulani Wisesa[1], Retno Tri Wulandari[1]
[1]Universitas Negeri Malang, Indonesia

Received : April 5, 2023	Revised : June 15, 2023	Accepted : June 20, 2023	Online : September 30, 2023

Abstract

Knowing the characteristics of animals is one of the competencies for early childhood. To learn this topic, the teacher usually uses two-dimensional animal illustrations. Along with the times, the use of learning media with technology-based is highly recommended for use in the learning process. Responding to this, this study's main aim was to design and develop 3D flashcards as learning media based on augmented reality that can be integrated with smartphones. The developed media will be used to convey learning material about animal characteristics by recognizing their anatomy through three-dimensional flashcard illustrations and the distinctive sound of each animal. The research method used the ADDIE model. The 3D flashcards were implemented for 60 children from two classes, aged between 5 – 6 years, and four teachers. The results were obtained that 92% of children could recognize animal characteristics in each 3D flashcard scanned using a smartphone. The sound in each animal helps students recognize the type of animal they are studying more. According to the teacher, utilizing this technology greatly increases children's enthusiasm for learning. The limitation of this study is the learning method that must involve parents. The novelty of this research is a learning method that involves parents using smartphones for positive purposes in the child's learning process. Some parents are against using smartphones for early childhood, but without realizing it, the demand for technology literacy must get used to it from childhood.

Keywords *Augmented Reality, Flashcards, Illustrations, Animals*

INTRODUCTION

Entering the Revolutionary Era 4.0. bring tremendous impact to every aspect of life. One of these impacts can be felt in the education sector. The Revolutionary Era 4.0 was marked using technology and information devices in the education sector (Pan et al., 2021). The learning process shifts from delivering material traditionally by means of the teacher delivering lessons in class to changing to a learning process that does not have to be in class; it can also be done outside the classroom online through a special video-conferencing application. The learning media used by teachers to convey material are all just explanations on the board or media images that can only be observed in two dimensions, currently shifting to various variants of digital-based learning media. The use of the latest information and technology, not only at the higher education level but starting with early childhood education, teachers must also keep up with the times by using the latest technology in the learning process. Based on these problems, this research develops digital learning media that can be applied to early childhood. The development of this media is also a solution to direct the use of gadgets in a more positive direction for early childhood. Seeing the current phenomenon in the field, young children are very familiar with using mobile phones.

Early Childhood Education is a learning activity aimed at children from birth to the age of 6 (six) years. Early childhood education is a form of implementation education that focuses on laying the foundation for growth and development, both motor coordination (fine and gross), emotional intelligence, multiple intelligences (multiple intelligences), and spiritual intelligence. Learning is carried out through the provision of educational stimuli to help physical and spiritual growth and

Corresponding author's email: denik.ristya.fs@um.ac.id

development so that children are ready to enter further education. Therefore, the early age for a child is a strategic period for the development of further life (Choiriyah & Dhieni, 2022). Parents need to provide the right stimulus at the age of the child's growth and development and make the best use of the child's growth age (Ansari et al., 2019). This age is often also called the Golden Age; at this age, the process of absorbing knowledge given to children runs quickly. For children who get a good stimulus to learn certain knowledge, it will be easy for children to develop their knowledge. However, on the contrary, if at this age, it is not used properly to provide stimulation in the form of knowledge or positive habits, then in the future, it will be difficult to change their study habits.

Learning in Early childhood education children should be done by playing. Through the process of playing, children can be happier doing the learning process. (Ingunn Størksen a, 2023) Therefore, in this study, flashcards were developed, which can also be used as a means for children to play while learning. The learning process through games makes children not get bored easily; they will have high enthusiasm or enthusiasm because they feel happy learning something.

Based on the 2013 Early childhood education Curriculum, one of the basic competencies that must be given to early childhood in school is basic competencies 3.8. Get to know the natural environment (Animals, plants, weather, soil, water, rocks, etc.). One of the learning activities provided by the teacher to complete these basic competencies is to introduce students to the various characteristics and characteristics of animals. In the learning process, if it is in a normal/not a pandemic situation, the school makes an outing program or invites students directly to the field, for example, to study the types of animals that are held by the school on field trips to zoos or parks. This activity aims to allow students to get to know animals and their carats, and their characteristics firsthand. During the COVID-19 pandemic, many children have had to stay at home as schools and childcare centers have been closed (Yang et al., 2023). Students are no longer able to take part in outing activities outside of school; even learning takes place online. Based on this background, the authors developed flashcard learning media as an innovation to study animal characteristics in three dimensions. This learning media can be used for learning at school or at home with the assistance of parents.

Previous research has developed AR-based learning media for early childhood. In foreign language learning, AR-based learning media have been developed that focus on learning theory, pedagogy, and sustainability. The research states that AR-based learning media has many advantages (Karacan & Akoğlu, 2021). In Mathematics lesson, using a mobile AR interface for learning media provide opportunities for improving students' special ability (Ozcakir & Cakiroglu, 2021; Wan Daud et al., 2021).

LITERATURE REVIEW

Children are unique individuals. A child has a pattern of growth and development in several aspects, namely physical, cognitive, socio-emotional, creativity, language, and communication aspects that are in accordance with the stages that the child is going through. At this age, it is often called a child in the "golden age," or what is called the golden age. The golden age is considered a period of good growth and development. Currently, almost all potential children experience sensitivity to grow and develop rapidly. The development of each child is not the same because each child has a different development. Another thing that affects children's development is that food that has balanced nutrition and intensive stimulation is needed to trigger child growth and development. If the child is intensively stimulated by his environment, then the child will be able to undergo the process of development properly. Early childhood education has a very extraordinary influence on children's development because it lays the foundation for further development. Early education has a huge impact on the attitude, behavior, and intelligence of a child when the child is an adult.

The characteristics of children at an early age (2-4 years) include: 1) children have an active nature in exploring objects around them. The exploration carried out on the objects encountered is a very effective learning process. 2) Children begin to learn to develop language skills, namely by chattering. The child learns to communicate, understand the conversations of others, and learn to express the heart and mind. 3) Children learn to develop emotions based on environmental factors because emotions are more commonly encountered in the environment. Media comes from latten and is the plural form of the word "medium," which is then literally interpreted as "intermediary". Media as a message (a source) with a message receiver (a receiver). In the learning process, media is used as a message delivery that will be conveyed by the teacher to students. Messages in the form of teaching content and upbringing in the curriculum are poured by teachers into the media in the form of communication symbols, both verbal symbols (spoken or written words) and non-verbal or visual symbols. Furthermore, the recipient of the message (student or teacher bias) interprets the communication symbols so that the message is obtained. Dewi mentioned that learning media plays a very important role in stimulating all aspects of early childhood development because, for early childhood, learning is carried out hammering to play using media, both real media, audio media, visual media, surrounding environmental media, and audio-visual media so that learning activities in early childhood run effectively.

Augmented Reality is a concept of merging the virtual world into the real world. The creation of a virtual world is carried out to evoke the perception of the user to understand the information of the recognized object. Augmented Reality is defined as the use of real-time digital computer devices and other specialized hardware and software to produce a simulation of the world or an alternative environment that is believed to be real or true for the user. AR can provide the possibility to provide additional and contextual information to support learning, integrating the child's learning environment with the real environment. (Karacan & Akoğlu, 2021). There are two methods of recognizing markers in augmented reality, namely: by using markers and not using markers or markers less (Fan et al., 2020). A marker is a special marker made like a barcode or black frame, while a markerless is a marker that relates to an object directly.

Currently, augmented reality is becoming a technology that is quite in demand. AR applications can engage users with contextual and local-specific information. (Ermolayev & Mayr, 2019) In this study, the development of augmented reality-based learning media aims to help early childhood recognize learning content and more quickly understand the material provided.

Previous research claimed that augmented reality was an emerging technology in the field of early childhood education (Ozcakir & Cakiroglu, 2021). The potential benefits and application of AR in early childhood education are :

1. Enhancing Engagement and Interactivity: AR can make learning more engaging for young children by bringing virtual objects and characters into their real-world environment. It provides interactive and immersive experiences that capture children’s attention and promote active participation.
2. Supporting Multisensory Learning: AR can stimulate multiple senses, such as vision, hearing, and touch, to facilitate multisensory learning experiences. It allows children to manipulate virtual objects, hear accompanying sounds, and see visual cues, providing a more holistic learning environment.
3. Fostering Spatial and Cognitive Skills: AR applications can help develop spatial awareness and cognitive skills in young children. By interacting with virtual objects and exploring their relationships with the physical environment, children can improve their understanding of space, shapes, size, and spatial relationships.
4. Supporting Language and Literacy Development: AR applications can be used to enhance

language and literacy skills in early childhood education. By integrating text, audio, and visual cues, AR can assist in vocabulary acquisition, phonics learning, storytelling, and language comprehension.

5. Connecting the Virtual Real Worlds: AR blurs the boundaries between the virtual and physical worlds. It allows children to bridge their real-life experiences with virtual content, creating meaningful connections between abstract concepts and their real worlds applications.

Augmented reality is a clever concept because children learn by developing their imagination. Children gain material while adding experience and forming objects in the real world. The absorption of children's knowledge at an early age is carried out by playing. However, children's play should be used to train children's fine motor and gross motor to maximize children's learning activities at the earliest possible age. The form of media that can support early childhood learning activities is innovative learning media. One of them is augmented reality-based learning media. With augmented reality technology, the learning process carried out by playing using AR media becomes more interesting and fun because virtual objects are displayed in a form that seems real; how to operate the learning media is also not difficult. In this AR-based learning media, by presenting virtual objects in the real world, children will be invited to imagine increasing their creativity. Learning media based on Augmented Reality is suitable for learning in early childhood education. This is because learning using Augmented Reality can make students experience learning directly.

RESEARCH METHOD

The research approach chosen is a development research approach with an ADDIE model. The ADDIE model is one of the systematic learning design models. The selection of this model is based on the consideration that this model is developed systematically and is based on the theoretical foundation of learning design. This model is systematically arranged with a sequence of activities that are continuous to solve learning problems related to learning resources that are in accordance with the needs and characteristics of students. This model consists of five steps, namely (1) analysis (analyze), (2) design (design), (3) development (development), (4) implementation, and (5) evaluation (evaluation).

The first step taken by the researcher is to do the analysis. At this stage, the researcher collected data, namely: (1) the first stage of evaluation data was in the form of data related to the characteristics of students, the basic competencies of the material for which the media would be developed, and observing the learning process that took place in the UM Laboratory Kindergarten KB class before the learning media was developed. (2) Design development, based on the results of the analysis that has been carried out on the research object, the next step is for the researcher to compile several alternative designs in media development and compile material content designs that are in accordance with the characteristics and needs of students. (3) Development, in the development stage, researchers have started to develop and realize learning media products based on designs that have been made, making book designs using Photoshop and Corel Draw software, while application development uses Unity and Vuforia software. (4) Implementation, at this stage, the researcher applies the learning media that he has developed and conducts trials. The trials were carried out by individual trials on media experts and field trials on research subjects in UM Laboratory Kindergartens and Kindergartens. (5) Evaluation, at this stage, the research team measured the success of implementing the developed learning media.

The data collection technique was carried out by distributing questionnaires to media experts and material experts during validation. Apart from that, to measure the effectiveness of using media, data is also collected by asking parents of students or teachers to fill out

questionnaires to get feedback after using learning media. Data on research subjects will be taken twice, namely the first pre-test before using the media and the second post-test after using the media.

Analysis of data validation results and trials will be analyzed using the Central Tendency measurement technique in the form of an average score. From each evaluator and user, the average score is sought so that the results can be interpreted. The results of data analysis are interpreted based on the following table.

Table 1. Scoring Guide

Score Range	Criteria
85-100	Very /Relevant
70-84	Eligible /Relevant
60-70	Fairly Eligible/Relevant
45-59	Inadequate/Relevant
0-45	Inappropriate/Relevant

FINDINGS AND DISCUSSION

1. Analysis of Early Childhood Needs for Augmented Reality-Based Innovative Learning Media

The child is a unique individual in that he has a pattern of growth and development in the physical, cognitive, socio-emotional, creative, language, and communication aspects that are specific to the stages that the child is going through. Early childhood is often referred to as the "golden age". Currently, almost all potential children experience a sensitive period to grow and develop quickly and violently. The development of each child is not the same because everyone has a different development. Learning in early childhood is essentially a game, that play is learning, where play is an activity that is carried out repeatedly and causes a sense of pleasure and satisfaction for children; play is a means of socializing to get the opportunity to explore, express feelings, create, and find fun learning tools, as well as a vehicle for self-recognition and the environment around children to find their lives. Early Childhood learning materials are also very varied. From the results of observations in the field, data were obtained that stated that Early Childhood only develops the logic of thinking, behaving, and creating. Early Childhood also prepares children to be ready to learn, that is, ready to learn to count, read, and write. Learning materials are free; the important thing is that Early Childhood develops religious, emotional, social, physical, motor, language, artistic and intellectual aspects.

2. Designing Applications of Virtual Zoo and Augmented Reality-Based Animal Illustration Flashcards

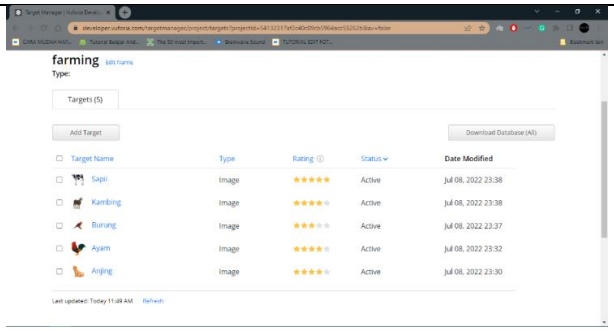
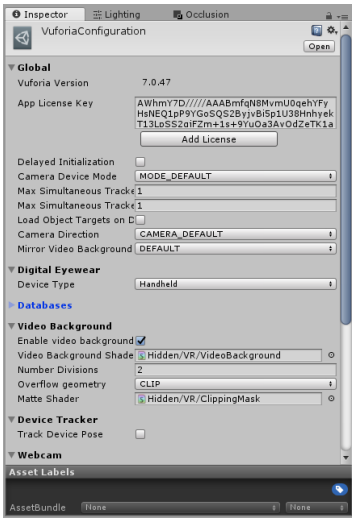
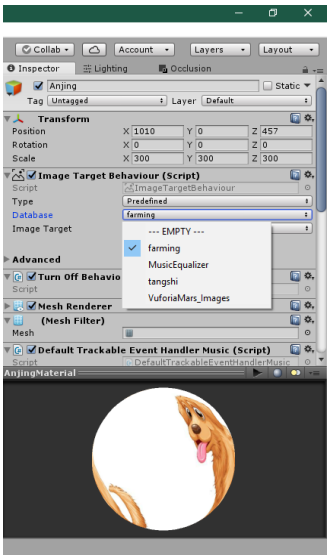
Entering the post-pandemic era, learning in schools must be more innovative. Along with students who are generation z, one of the characteristics of which is that the generation is already familiar with technology, then the development of learning media must be appropriate for these needs.

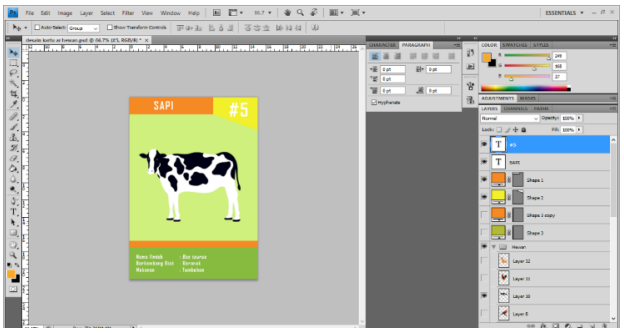
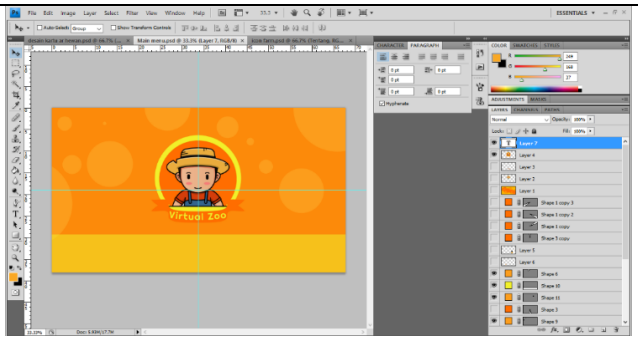
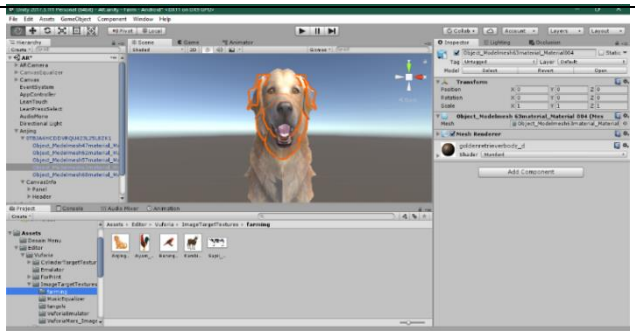
Based on observations in the field, the current learning media needs for ECCE students are learning media that can activate students. This is in line with the learning approach in the 21st era is a student-centered approach. The teacher in the classroom is only a facilitator; to learn something, learners will be better if they experience firsthand what they learned.

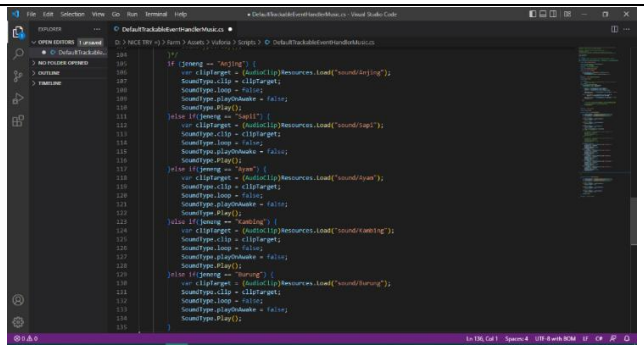
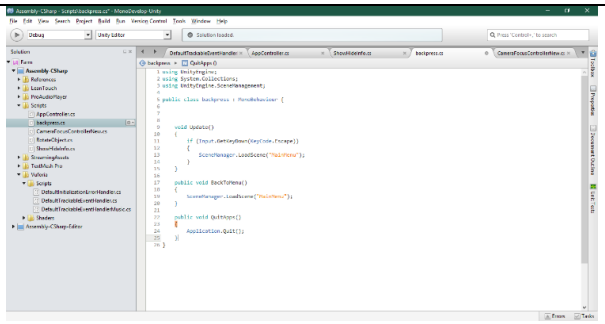
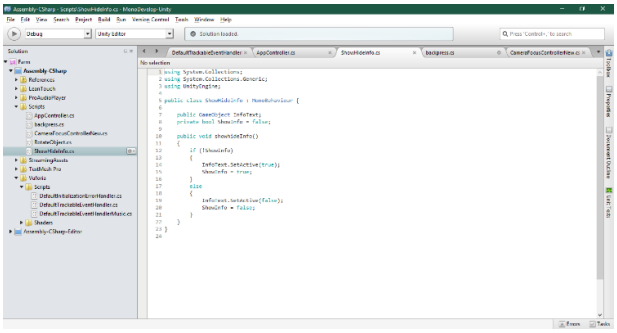
Based on the results above, this is in line with the idea of the research team that develops

audiovisual and augmented reality-based learning media. This learning media uses an Android device with the assistance of teachers or parents in its operation. With this learning media, it is hoped that students can learn the characteristics of animals from their sounds and shapes. The stages of product development carried out are as follows:

Table 2. Design Process

No	Pictures	Explanation
1		Create an AR marker database on the Vuforia Website
2		Vuforia Database License Key Configuration
3		Select and insert the Vuforia database markers into each 3D object.

4		Make a marker card design.
5		Create a button design for the main application menu.
6		Make the main page design of the application.
7		Modeling 3D animal objects and inserting textures with the help of the Unity 3D application.

8		Create a short information textbox about the animal.
9		Coding to present narrative content for each animal that the AR camera will detect
10		Doing coding for the navigation buttons used in the Virtual Zoo application.
11		Coding for short animal information panels.

3. Development Product Results/Application Interface Display

Figure 1. Home Screen Applications

The picture above is the display when the virtual zoo application is installed. The developed application can only be installed on Android-based smartphone devices. On the home screen, what is the name of the application, some navigation instructions, and instructions for starting and exiting the application? The back screen display of the application interface provides an illustration of an animal as an introduction that the application will help to learn about animal characteristics. The research team chose yellow because the object of research on this application's users were children, so the color was attractive and liked by children. To use this learning media, students must be accompanied by parents or teachers at school because, in general, early childhood do not have their own smartphone devices. The learning media developed are indeed designed to be used jointly between children and parents or teachers so that in the learning process, children get additional explanations.

Figure 2. User Guide

The application is equipped with instructions for using the application and cards so that teachers or parents can easily accompany their children to study. When the flashcard is scanned, a sound will appear based on each type of animal. The sound is expected to stimulate students to recognize what animal they are observing. In addition, to make it easier for teachers and parents to explain the characteristics of animals, the application is also equipped with narrative storytelling explaining each animal's character.

Figure 3. Flashcards layout

In this study, the research team developed 5 different types of flashcards. The types of animals are chosen based on the number of legs they have, with goats, dogs, and cows representing four-legged animals and birds and chickens representing two-legged animals. In addition, some of the animals displayed on the flashcard have different breeding methods, namely, goats, dogs, and cows give birth, while chickens and birds lay eggs. Animal characters through flashcards can also be identified from what type of food they eat; for example, goats and cows are herbivores, dogs are carnivores, and chickens and birds are included in the group of poultry that eat grain.

After the media has been made, then do expert validation. The development stage includes the validation of experts and practitioners. Based on the suggestions of validators and practitioners, revisions were made to the flashcard color display, which was being developed in the framework to produce flashcards that can attract students' interest in learning. The validity of the data collection instrument is checked first before being tested in the field. Three experts validated the data collection instruments in this study. Several aspects are used in the validation process, including Material validation gets a score of 93.3% with a very valid category, while media validation gets a score of 89.5% percent with a very valid category.

4. Implementation Products

Learning devices are used in the classroom after the validator determines they are feasible. This stage is carried out in a class of 15 children and is applied to one learning theme. To find out the extent to which the benefits and ease of use of the teacher carried out a practicality test. This practicality test aims to find out whether flashcard learning media based on Augmented reality can help young children improve their ability to recognize animal characters. Based on the practicality test conducted by teachers and principals, where the average practicality percentage for each aspect of the assessment is 90%. According to the results of the practicality test, Augmented reality-based flashcard learning media content aimed at increasing children's ability to recognize animal characters is very practical. The trial was conducted on children aged 5-6 years. The trial process for children is carried out under the direction of the teacher. Each child is given a flashcard, and then, one by one, they try to scan with the teacher and observe the animals on their flashcards.

Figure 4. Implementation Process

Furthermore, an analysis of the effectiveness of the data was obtained by calculating the results of the assessment of learning media on children's interpersonal intelligence in group B1 tests of 15 children. Effectiveness assessment data of 83.1% can be declared effective.

5. Evaluation Process

The final product of this research is augmented reality-based flashcard learning media integrated with an application on an Android smartphone that is designed to improve the ability of children aged 5-6 years to recognize animal characteristics. This final product has undergone several revisions from the media and material experts, but material experts have not made any changes. In media validation, there are several inputs and improvements from media experts, namely, color changes, font changes, and flashcard size changes. The process of developing flashcard learning media based on augmented reality to improve the ability of children aged 5-6 years to recognize animal characteristics using the ADDIE model (Analysis, Design, Development, Implementation-Evaluation). The development of Augmented Reality-based flashcard learning media was developed based on the need in the field for an alternative media learning resource that can provide appeal to children to identify the characteristics of animals—viewed from the aspect of presenting animal illustrations and colors that can attract students' attention and motivate students. In addition, from the aspect of clarity, it is very precise, so it has an impact on students in improving their ability to recognize animal characteristics. This is in accordance with the theory,

which states that learning media is anything that is used to convey messages from the sender and recipients to stimulate the thoughts, attention, feelings, and interests of students.

In terms of design, children are motivated to identify animal characteristics based on the sound and three-dimensional shapes that appear on the cell phone after the flashcard is scanned. This is because learning media designed to combine audio and visual can support the learning process. Flashcards based on augmented reality have the characteristics of a 3-dimensional shape that makes children interested because it seems as if they can observe animal shapes directly like they are observing at a zoo. The use of augmented reality-based media in learning is very effective as a medium for developing student enthusiasm and motivation. The use of flashcard learning media makes students enjoy the learning process more involving media and components of image, color, sound, and motion. Combining several components can attract interest in learning and add to a more meaningful learning experience for students.

CONCLUSION

The object of study can use the developed media. The use of Flashcard learning media based on augmented reality supports the technology-based learning process in the 4.0 revolution era. The introduction of technology as a learning medium starts at an early age, effectively familiarizing children with learning via smartphones and internet devices. This can be used to shift the use of smartphones so that they are not solely for playing or watching entertainment. Innovation in the development of learning media using smartphones can familiarize students with using these devices to learn something. During the trial process of using augmented reality-based flashcard learning media, teachers and students were very enthusiastic about using the media. Teachers feel happy because they can learn about new learning media that they have never tried before. Students are also happy because they can learn in class from different experiences, namely observing animal characteristics such as their original form in their environment or at the zoo. Adding audio features in the form of sounds from each animal really helps children learn the characteristics of animals. In this study, only 5 types of flashcards with animal illustrations were developed, input from experts so that they can develop more flashcards in the future. The flashcard developed can introduce several animal characters, starting from the various types of food, characters based on the number of legs, animal characters based on how they breed, and animal characters through their distinctive sound.

This research concludes that the learning media developed can be applied because, based on the results of the validation and trials, they meet the eligibility requirements for use. In the future, increasing the number of animals that students can observe needs to be improved or further developed. This is so students can get to know the characteristics of more animals. The use of storytelling contained in the application has been proven to help parents or teachers explain animal characters to children. Based on the storytelling guide in the application, teachers can develop the story framework based on the animals that live around their environment.

LIMITATIONS & FURTHER RESEARCH

Based on the results of the implementation and trials in the field, there are several weaknesses in the development of this product that need to be improved in the future, including media in the form of flashcards with glossy art paper material, which are easily damaged and crumpled by children, so that in the future flashcards can be developed that use durable materials, for example, PVC. The second drawback is that the application used to scan flashcards is still based on Android; this limits the flexibility of use because Apple-based smartphone users cannot use it. In the future, improvements need to be made so that it can be used on any type of device. The third weakness is that the use of instructional media, which must involve parents or teachers, cannot be used

independently by students. They should always be used under parental supervision. Based on some of the limitations of the research above, maybe in the future, it can be developed so that this learning media is more applicable in its application.

Future research can also develop three-dimensional learning media based on augmented reality in other forms, for example, books, posters, or in other forms of media. The number of animals in this development, which is very limited, can also be developed into even more so that student references can understand the characteristics of animals more completely.

Product trials that are only carried out in one school, in the future, can be expanded by conducting trials in several different schools to get a trend of using more varied learning media results. This is to analyze whether the learning media developed are truly applicable to the learning process.

REFERENCES

Ansari, A., Pianta, R. C., Whittaker, J. V., Vitiello, V. E., & Ruzek, E. A. (2019). Starting Early: The Benefits of Attending Early Childhood Education Programs at Age 3. *American Educational Research Journal*, *56*(4), 1495–1523. https://doi.org/10.3102/0002831218817737

Choiriyah, M., & Dhieni, I. (2022). The effectiveness of multimedia learning for distance education toward early childhood critical thinking during the COVID-19 pandemic. *European Journal of Educational Research*, *11*(3), 1553. https://doi.org/10.12973/eu-jer.11.3.1553

Ermolayev, V., & Mayr, H. C. (2019). *ICT in Education, Research, and Industrial Applications. Proc. 15th Int. Conf. ICTERI 2019. Volume I: Main Conference.* (Vol. 2387). http://ceur-ws.org/Vol-2387/

Fan, M., Antle, A. N., & Warren, J. L. (2020). Augmented Reality for Early Language Learning: A Systematic Review of Augmented Reality Application Design, Instructional Strategies, and Evaluation Outcomes. *Journal of Educational Computing Research*, *58*(6), 1059–1100. https://doi.org/10.1177/0735633120927489

Karacan, C. G., & Akoğlu, K. (2021). Educational Augmented Reality Technology for Language Learning and Teaching: A Comprehensive Review. *Shanlax International Journal of Education*, *9*(2), 68–79. https://doi.org/10.34293/education.v9i2.3715

Ozcakir, B., & Cakiroglu, E. (2021). An augmented reality learning toolkit for fostering spatial ability in mathematics lesson: Design and development. *European Journal of Science and Mathematics Education*, *9*(4), 145–167. https://doi.org/10.30935/SCIMATH/11204

Pan, Z., López, M. F., Li, C., & Liu, M. (2021). Introducing augmented reality in early childhood literacy learning. *Research in Learning Technology*, *29*, 1–21. https://doi.org/10.25304/rlt.v29.2539

Størksen, I., Rege, M., Solli, I. F., Braak, D. T., Lenes, R., & Geldhof, G. J. (2023). The playful learning curriculum: A randomized controlled trial. *Early Childhood Research Quarterly*, *64*(3rd Quarter 2023), 36–46. https://doi.org/10.1016/j.ecresq.2023.01.015

Wan Daud, W. A. A., Ghani, M. T. A., Rahman, A. A., Bin Mohamad Yusof, M. A., & Amiruddin, A. Z. (2021). ARabic-Kafa: Design and development of educational material for Arabic vocabulary with augmented reality technology. *Journal of Language and Linguistic Studies*, *17*(4), 1760–1772. https://doi.org/10.52462/jlls.128

Yang, Y., Zhang, X., Xie, W., Li, J., & Wang, Y. (2023). Transitions in patterns of caregiver involvement before and during the COVID-19 pandemic: A latent transition analysis. *Early Childhood Research Quarterly*, *65*, 23–31. https://doi.org/10.1016/j.ecresq.2023.05.006