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Development of Augmented Reality-Based Flashcard Media with a Universe Theme for Children Aged 5-6 Years at Ananda Palembang Kindergarten

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Abstract: *This research aims to develop a learning media by utilizing Augmented Reality-based technology. The Augmented Reality-based flashcard media is an advancement of the three-dimensional (3D) card media. The research method employed is Research and Development (R&D) using the ADDIE research model (Analysis, Design, Development, Implementation, Evaluation). The research results indicate that the Augmented Reality-based Flashcard Media was developed based on the assessment of content experts, with a score of 94.2, indicating high validity. The language expert evaluation yielded a score of 84, also considered highly valid. Additionally, the evaluation by media expert I resulted in a score of 90, and expert II evaluation yielded a score of 96, both indicating high validity. The small-scale trial obtained a score of 95.2, denoting excellent performance, while the large-scale trial yielded a score of 96.5. In conclusion, the Augmented Reality-based flashcard is deemed highly suitable for use in learning media.*

Keywords: *Augmented Reality, Flashcard, Universe Theme*

A. Introduction

Early Childhood Education is something that is needed in life because through early childhood education, we can make children become an educated, creative generation and have a good personality, and also broad knowledge. Education is an effort to mobilize all the potential that children have by creating learning situations that suit their character. (Mustaqim, 2016) The development of the 2013 Curriculum is carried out as an effort to improve the quality of education to produce graduates who are creative and able to face life in the future. In addition to the 2013 curriculum approved by the Ministry of Education and Culture to bring changes in education in Indonesia. Indonesia also participates in the Sustainable Development Goals (SDGs), a global action plan agreed by world leaders, including Indonesia, which contains 17 Goals and 169 Targets that are expected to be achieved by 2030. One of the goals is quality education by ensuring inclusive and equal quality education, as well as supporting lifelong learning opportunities.(Hamdani & Sondang Sumbawati, n.d.)

Therefore, we must prepare ourselves as early as possible, especially as educators are required to find innovative learning media so that the material we teach to early childhood becomes more interesting and easy to understand. Progress Technological development must be in line with improving the quality of Human Resources (HR) so that the direction of development of science and technology can reach the right target. One of the technologies that is growing rapidly today is a Smartphone or smartphone. Smartphones become very useful because internet facilities become windows to the world to exchange information. So that it encourages smartphone users to increase from year to year. Based on the latest Percentage (Kominfo) which explains that Smartphones used in Indonesia reached 370.1 million. This figure increased by 13 million or 3.6 percent from the same period in the previous year. The percentage of users under the age of 65.34%, teenagers 75.95%, adults 68.34%. The existence of technology, especially smartphones which are now growing must be addressed wisely. The advantages obtained from technological advances must be dug deeper for better human survival. (Yanti et al., n.d.)

The development of technology and science affects the learning process in schools and also affects the learning material taught and the way the material is delivered in the learning process, especially in early childhood education. Therefore, the use of media is highly recommended in developing learning, especially learning in ECCE institutions. Learning media is anything that is used to convey messages that can stimulate early childhood thoughts, feelings, attention, and willingness to learn. The learning media that is widely used today is only textbooks. These textbooks have several weaknesses, such as the content of the book which is often not following the curriculum, resulting in educational programs not being achieved, and the teaching materials seem mediocre due to the long period of use so some information is lost. no longer suitable for what young children face, inadequate exercises and assignments due to the limited size of the book. (Nidhom et al., n.d.)

One type of Visual 3D learning media is *Flashcards. Flashcards* are one of the learning media that are much loved by children and used by adults (teachers) in the learning process in the classroom. Along with the times, technological developments at this time are very rapid, and many various technologies have been created. Currently, *flashcards* are not only 2D, but with the help of *Augmented Reality* technology can produce *flashcards* in 3D or can be seen in real. which is not possible for teachers to present directly in front of early childhood in the classroom, but teachers can still provide new knowledge and learning experiences for early childhood. So that children's needs related to problems in learning the universe can be overcome with Augmented Reality-Based Flashcards. The development of Augmented Reality-based cards as learning media can be developed and several previous studies are revealing the success of developing Augmented Reality-based card learning media. (Program Studi et al., n.d.)

In (Munthe & Sitinjak, n.d.)research entitled Development of Augmented *Reality-Based* Flashcard *Media on Knowing Marine Animals Material, the results of* Augmented *reality-based* Flashcard *media research* developed have met valid, practical, and effective criteria for use in marine animal recognition materials for early childhood. Then in the (Nurfadillah et al., 2021)with the research title Augmented Reality-Based Card Design (AR-

CARD) as a biology learning medium on the theme of bacteria. The result of this study is the design of Augmented *Reality* (AR-Card)-based card media on bacterial material. This card is integrated with 3D biological objects, especially the concept of bacteria so that students can see directly small biological objects with the Biology AR Card technology. In addition, (Mustaqim et al., n.d.)with the research title AR Card Development Based on Augmented Reality Technology as Multimedia Mathematics Learning obtained research results that the use of AR playing cards can attract children's interest in learning, AR cards are easy to use and can help in learning Mathematics and provide satisfaction for its users. From previous research analyses, many have developed AR (Augmented Reality) based cards on matter outside the Universe. Augmented Reality-based Flashcard learning media, especially on the material of the universe, does not yet exist.

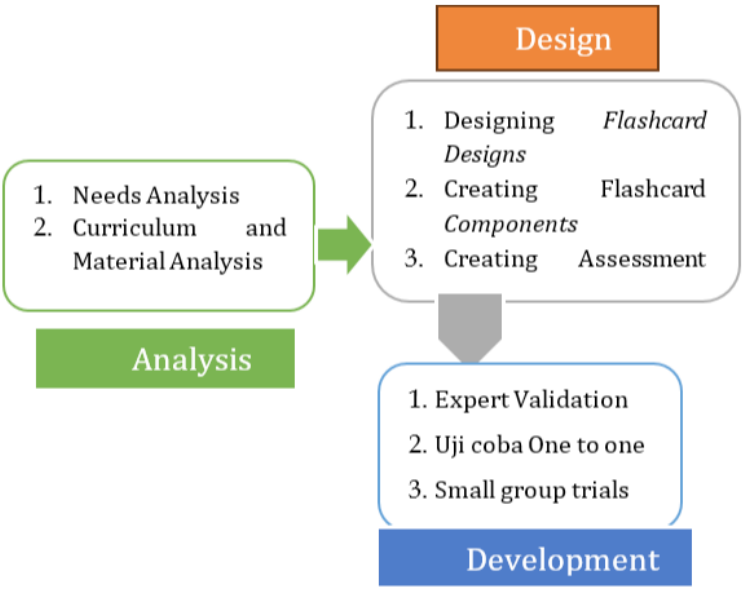
In addition, current technological developments have given birth to an innovation called Augmented Reality abbreviated as AR, which is a technology that can collaborate a 3-dimensional object into a real environment using webcam media. The use of AR has been used in developed countries for various purposes, especially in the field of Education. According to the results of research by Malinka Ivanova and Georgi Ivano, the use of AR as a learning medium can help early childhood understand concepts and theories, stimulate children to think conceptually and feel 3D, improve images (representations) and perceptions, create an interactive and attractive learning atmosphere and more fun. (Rizqi & Aghni, n.d.)

The purpose of this research is to determine the process of refurbishing old products from ordinary Flashcard media into Augmented Reality-based Flashcards with the theme of the Universe as Augmented Reality-based learning media for teachers in explaining universe-themed material to children aged 4-5 years. years and know the level of regularity.

B. Method

The research method used, namely Research and Development (R & D) is a research method used to produce certain products and test the effectiveness of these products.

According to Borg and Gall, "Research and development is a powerful strategy for improving practice. It is a process used to develop and validate educational products." "Research and development is a powerful strategy for improving practice. It was the process used to develop and validate educational products. The development stage of AR-based Flashcards (Augmented Reality) on the theme of the Universe is carried out with the ADDIE model consisting of Analysis, Design, Development, Implementation, and Evaluation. According to Product development measures, this research and development model is more rational and more complete. This research is focused on research with only 3 stages, namely *Analysis, Design, and Development* because there are constraints, one of which is time, energy, and cost. Flashcards resulting from the development are not disseminated to schools.



The population of this study was kindergarten B students at Ananda Kindergarten Palembang. The number of small-scale trial samples is 5 students and large-scale trials are 10 students. Data collection techniques use interviews, questionnaires, observations, and documentation. This research uses data analysis techniques in the form of validity, and feasibility. The

results of the data obtained from the validity test questionnaire and feasibility were then analyzed using the Likert scale based on the response questionnaire score rules.

C. Result and Discussion

The novelty of this research is that the cards contain augmented reality technology. If ordinary flashcards only see the images on the card, but with the presence of augmented reality-based technology, young children can see directly the objects being studied in real life, for example by looking directly at them. the real sun rotates and shines. As for the stages in this development research, there are several stages, namely Analysis, Design, Development, and Evaluation which will be explained as follows:

1. The Analysis

The stage has three stages, where at this stage the researcher determines the background of media development, including:

a. Needs Analysis

The needs analysis stage was carried out by interviewing the head of the kindergarten and teachers at Ananda Palembang Kindergarten to find out the problems experienced by early childhood in the learning process. The obstacles faced in the learning process are; 1) The learning process about the Universe is still carried out using conventional media such as picture books, the use of used materials, blocks, and natural materials. 2) Lack of teacher knowledge about technology-based learning media. 3) There is no operational assistance in kindergartens that support technology-based media. 4) Teachers only use the medium of one picture book to explain the theme of the universe, the use of this one book makes the learning process ineffective, and the large number of children in the class makes early childhood not interested in following the learning process.

From these problems, researchers formulated the purpose of this study, which is to produce a universe-themed *Augmented* Reality-based flashcard media that can facilitate early childhood the learning process and early childhood can visualize the universe in reality. a) Curriculum and Material Analysis: In this stage, researchers analyze the 2013 curriculum contained in

Permendikbud 146 of 2014 by analyzing the main material, core competencies (IC), Basic Competencies (KD), and indicators following the 2013 Curriculum to be studied.

Core Competencies are following the 2013 ECCE Curriculum of Permendikbud 146 of 2014 as follows: KI-2. Have healthy behavior, curiosity, creativity aesthetic, confidence, discipline, independence, caring, ability to cooperate, ability to adjust, honesty, and politeness in interacting, with family, educators, and friends. KI-3. Recognize self, family, friends, educators and/or caregivers, the surrounding environment, technology, art, and culture at home, places of play, and ECCE units by: observing with the senses (seeing, hearing, sniffing, feeling, touching); inquired; collect information; process information/associate, and communicate through play activities.

Basic competencies according to the PAUD Curriculum 2013 Permendikbud 146 Year 2013 are as follows.

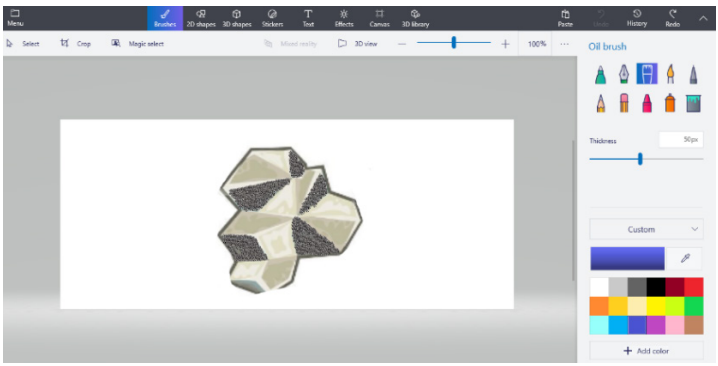
Cognitive	Emotional Social	Language	Art
1.6 Get to know surrounding objects (name, color, shape, size, pattern, nature, sound, textur, function, and other characteristics.) 1.8 and 4.9	1.2 Have behaviors that reflect the child's curiosity.	1.9 Understanding Receptive Language (Listening and Reading).	2.15 Get to know various works and the effectiveness of art

2. Design Phase

At this planning stage, researchers carried out three stages of design, as follows: first designing the front image of the Flashcard, which is an image of a universe object designed by the researcher himself using the *Paint 3D* application. Second, design *the flashcard background* and the bottom writing in front of the back using the *Canva* application. Third, design the universe 3D Objects using *Assemblr Studio* which will arise when QR is scanned. Development for the initial product is designed at the development stage, which is in the form of

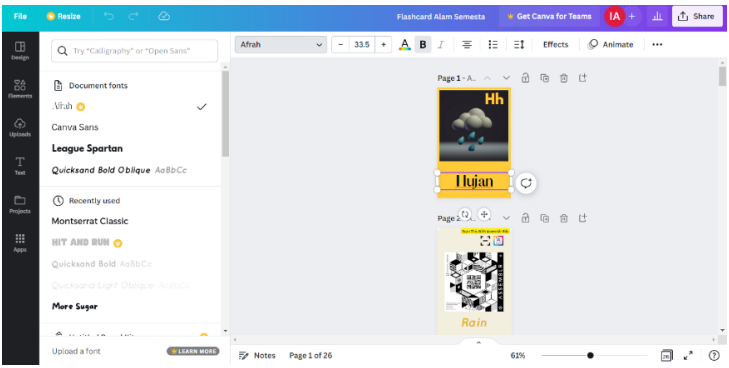
Flashcard media. For that, the *Flashcard* design consists of:

1) Object. The shapes of the objects are shown through the content of the object so that children can easily recognize the shapes. On this Flashcard, the object of the Universe was painted by researchers using the *Paint 3D application*. Painting images of universe objects with a variety of color choices has its uniqueness so that it can attract children's interest and attention. On the other hand, for the application of universe objects from *Flashcards* will appear in 3D in their original form through *the Augmented Reality* technology used.



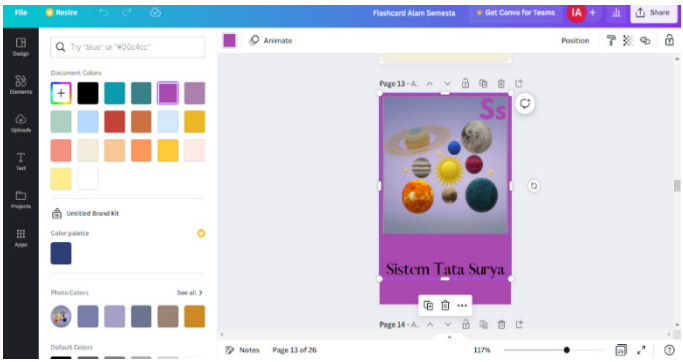
Design images of universe images on *flashcards* via *Paint 3D*

2) Object Name. Each object of the universe is named to make it easy to teach it to children. *Afrah* is a *font* used in writing the name of the universe object with a capital letter at the beginning of the name size 33.5 designed through the *Canva application.* This certainly can make it easier for children to read the name of the universe object. Furthermore, on the back of the card, a Marker is given using QR (*Quick Response*), and below it, there is an object name using English. So, on the *Flashcard the* name of the object is made in 2 languages, namely Indonesian and English, and given the initials of the name of the first letter of the object of the universe in Indonesian equipped with capital and lowercase letters.



Flashcard Design image via Canva

3) Background. Each flashcard is given a bright colorful background to beautify the flashcard and can attract attention from children.

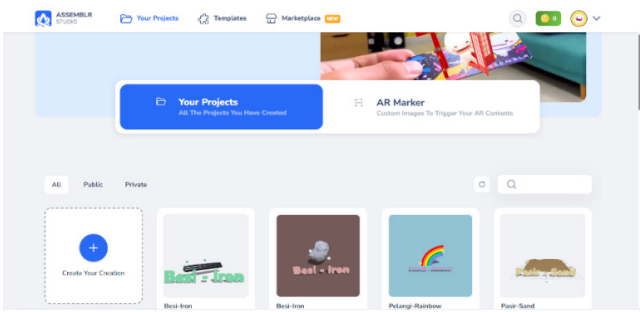


Flashcard Background Color Design Image

4) Cover. *The cover* in the form of a container for *flashcards* is made to look more attractive and easy to carry by children when used.

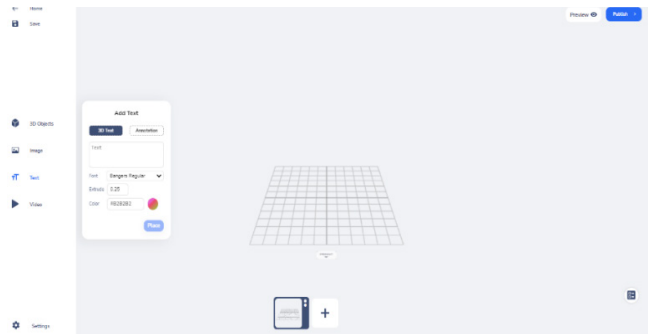
In the initial Flashcard *design,* 13 objects in the universe are introduced to children after an early age, namely: 1). Rain, 2). Sun, 3). Moon, 4). Rainbow 5). Star, 6). Night, 7) Solar System, 8). Water, 9). Iron, 10). Sand, 11). Stone, 12) Soil, 13). The mountain erupted. Furthermore, for the design *of 3D Augmented Reality* objects on the back side of *the flashcard*, namely *QR Barcodes* (*Quick Response*) which will appear as 3D objects when *scanned*, designed using the *Assemblr studio* application, which is as follows:

1) Open the *Assemblr Studio Website,* click *Create Your Creation*



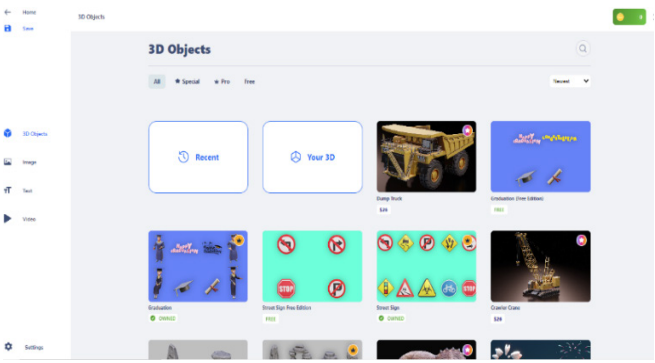
Front view of *Assembler Studio*
Source: https://studio.assemblrworld.com/markers

2) Then comes the 3D Object edit marker



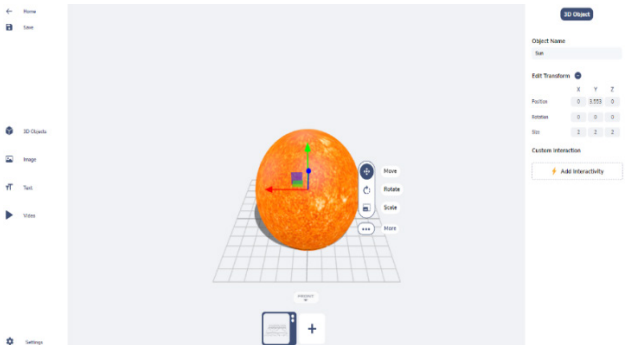
Assemblr Studio *3D Object Marker Display*
Source: https://studio.assemblrworld.com/markers

3) Next, find the object we want



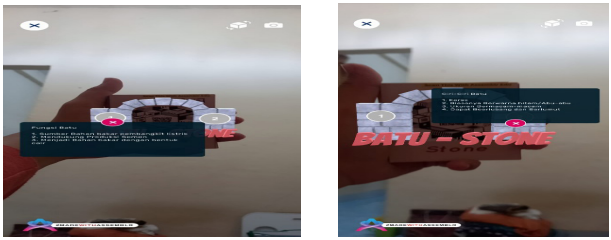
Search for 3D objects
Source: https://studio.assemblrworld.com/markers

4) Then, edit the 3D object by adding the object name, function, and characteristics to it



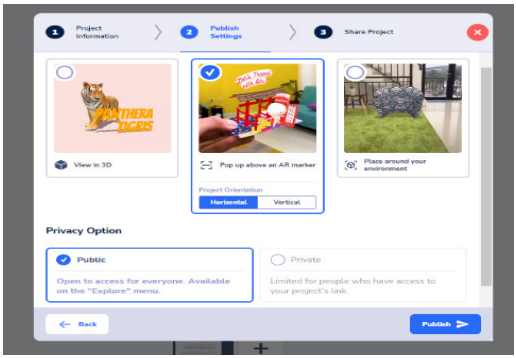
Edit 3D Objects
Source: https://studio.assemblrworld.com/markers

5) Next, add the functional material and characteristics of these natural objects



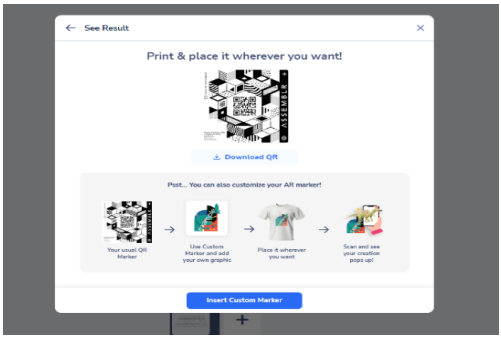
Explanation of functions and characteristics
Source : *Assemblr Edu Application*

6) When you're done designing, upload the design and select horizontal or vertical



Upload a Design
Source: https://studio.assemblrworld.com/markers

7) Finally, save the *QR (*Quick Response*) Barcode* to include in the *Flashcard* design in *Canva*.



Upload and save *QR* Barcodes(*Quick Response*)
Source: https://studio.assemblrworld.com/markers

3. Development Phase

This development stage is the stage to produce the final form of augmented reality-based flashcard media based on improvements or revisions from experts and trial data so that the product can be said to be feasible. There are several steps in this stage, namely:

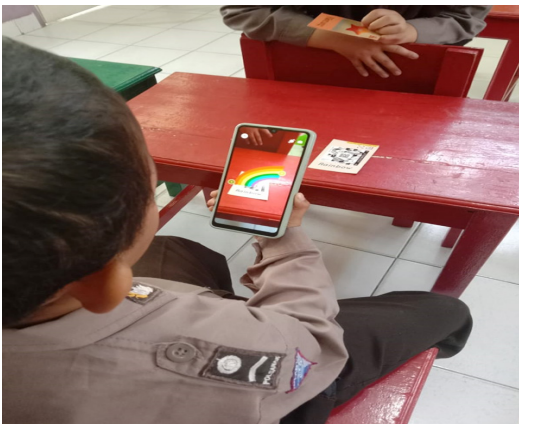
1) Material Validation Stage. The material validation stage is carried out to determine the level of validity of *Augmented Reality-Based Flashcard media.* Based on the results of the Augmented Reality-Based Flashcard *media validation assessment*, the validity level given by material expert validators is 96%, the value is in the very valid category.

2) Language Validation Phase. Based on the results of the validation assessment of Augmented Reality-Based Flashcard media language, the validity level given by linguistic validators is 84%, the value is in the very valid category.

3) Media Validation Stage I and II the validity level given by Media I expert validators is 90%, and Media II validators get a percentage of values of 96% these values are in the very valid category.

Thus, based on the validation results of the four validators through the results of the assessment of the level of validity and level of feasibility, it can be concluded that the *Augmented Reality-Based Flashcard* media developed by researchers is suitable for

use and tested in schools to measure the level of effectiveness. In testing the level of effectiveness of students through product trials, it can be measured through student instrument questionnaires. The questionnaire was filled out through the form of interviews and observations. Researchers will put a checkmark on each statement on the questionnaire according to the response of trial students to participants which was carried out alternately. Based on the student instrument questionnaire, the results of one-to-one trials obtained a percentage of 95.2% marks, for small group trials obtained a percentage of 96.5%. It can be concluded that Augmented *Reality-Based Flashcard* media is very effective for use by students in learning.



During the process of developing Augmented Reality-Based Flashcards at Ananda Kindergarten Palembang

D. Conclusion

Based on the results of data analysis carried out in research with the title "Development of Themed Augmented Reality-Based Flashcard Media "The universe in children aged 5-6 years at Ananda Palembang Kindergarten" and carried out according to a series of research starting from the Analysis, Design, Development stages. Therefore, it can be concluded that the Flashcard Development Process is Based on Augmented Reality as follows: 1) Analysis stage, namely by analyzing needs and curriculum and also the material at Ananda Palembang Kindergarten. Planning Stage (Design), namely by designing flashcards based on Augmented Reality designs front image using Paint 3D, designing flashcards back and forth using Canva, designing 3D objects Universe using Assemblr Edu, and preparing validation instrument sheet design. Stage Development, namely by validating experts involving 4 experts including material validation, language validation, validation Media I and 2. Next, after making revisions according to input from the validator, namely carrying out one-on-one trials and trials in small groups (small groups). 2) Declared very valid according to the validation that has been carried out at this stage of development, namely validation with 4 experts, namely, material experts the percentage of results with a total of 94.2% is categorized as "very valid". Expert Language has a percentage of results with 84% categorized 88 "very valid". Media/design expert I have a percentage of results by number 90.9% were categorized as "very valid". Media/design expert II has the percentage of results with a total of 94.5% categorized as "very valid". So, it can be concluded that it is a Media development product Augmented Reality-based flashcards with a universe theme for children aged 5-6 Years at Ananda Palembang Kindergarten.

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