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Augmented Reality Flashcard Prototype Design as an Instructional Medium for Introducing West Java Traditional Houses in Elementary School

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Abstract

Social Studies is a subject which contains topics about Indonesian traditional houses. Instuructional media for introducing traditional houses that are generally used in elementary schools are limited to video, 2-dimensional images, and textbooks. The use of media that is less varied results in students become bored. The use of technology in the field of education is increasing diverse which can make it easier for teachers and students to convey and receive the information. Augmented Reality is one of the technologies that can be used as an alternative to traditional house instructional media because it can display real traditional houses in 3 dimensions. This study aims to describe the design of an Augmented Reality flashcard prototype as a learning medium for West Java traditional houses in elementary schools. The method used was Design-Based Research which has four stages. This research was carried out until the second stage, namely developing product prototypes based on existing theories, design principles, and technological innovations. The result of this research is a flashcard prototype design and Augmented Reality application. The flashcards had two sides that were used as markers to bring up Augmented Reality objects. The Augmented Reality application was designed to have two main menus, each of which serveed to display a real West Java traditional house in the form of a three-dimensional object and displays a traditional house that can be seen from various sides or points of view. This application was also equipped with supporting features, such as complete information, sound, scale, rotation, and other features.

Abstrak

Ilmu Pengetahuan Sosial merupakan mata pelajaran yang di dalamnya memuat materi tentang rumah adat Indonesia. Media pembelajaran rumah adat yang umumnya digunakan di Sekolah Dasar terbatas pada media video, gambar 2 dimensi, maupun buku paket. Penggunaan media yang kurang bervariatif memungkinkan siswa menjadi bosan dan jenuh. Penggunaan teknologi dalam bidang pendidikan semakin beragam yang dapat memudahkan guru dan siswa dalam menyampaikan dan menerima materi. *Augmented Reality* merupakan salah satu teknologi yang layak digunakan sebagai alternatif media pembelajaran rumah adat karena dapat menampilkan rumah adat secara nyata dalam bentuk 3 dimensi. Penelitian ini bertujuan untuk mendeskripsikan rancangan prototype *flashcard Augmented Reality* sebagai media pembelajaran rumah adat Jawa Barat di Sekolah Dasar. Metode yang digunakan adalah *Design Based Research* yang memiliki empat tahapan. Penelitian ini dilakukan sampai tahap kedua yaitu mengembangkan prototype produk yang didasarkan pada teori, *design principle* yang ada dan inovasi teknologi. Hasil akhir dari penelitian ini adalah rancangan prototype *flashcard* dan aplikasi *Augmented Reality*. *Flashcard* memiliki dua sisi yang digunakan sebagai marker untuk memunculkan objek *Augmented Reality*. Adapun aplikasi *Augmented* Reality dirancang memiliki dua menu utama yang masing-masing berfungsi untuk menampilkan rumah adat Jawa Barat secara nyata dalam bentuk objek tiga dimensi dan menampilkan rumah adat yang dapat dilihat dari berbagai sisi atau sudut pandang. Aplikasi ini pun dilengkapi dengan fitur-fitur pendukung, seperti informasi yang lengkap, suara, *scale*, rotasi dan fitur lainnya.

Kata Kunci: Flashcard, Augmented Reality, Rumah Adat Jawa Barat, Media Pembelajaran.

INTROUCTION

Indonesia is a country rich in ethnic and cultural diversity. The diversity that Indonesia has includes the diversity of traditional houses that have different shapes and characteristics in each region. A traditional house is a

building that is a symbol of a tribe that has been passed down from generation to generation and is used by the local community as a place to live and carry out life activities.(Prasetyo & Astuti, 2017, p. 81). Traditional houses are a reflection of the cultural values and personality of a society(Budihardjo in Rahmansah, 2014, p. 56). One of the traditional houses in Indonesia is the traditional house of West Java.

The shape of the traditional house of West Java is identical to the house on stilts, the surface of the house does not blend with the ground but is supported by a wooden pole resting on a stone called an umpak.(Nuryanto & Ahdiat, 2017). Based on the beliefs and beliefs of the local community, the traditional house of West Java has three parts, namely upstream or head, crew or body, and tribe or legs.(Nuryanto & Ahdiat, 2017). Another characteristic of West Java traditional houses is that the front of the house usually faces south. In addition, the building materials are made from materials found in nature. Such as (1) woven bamboo walls called "chambers", (2) the floors are made of bamboo slabs and some use boards, (3) thatched or reed roofs, (4) wooden posts, (5) house ceilings. of woven bamboo, (6) doors of wood or woven bamboo, (7) windows of wood and some are made of glass, (8) and stairs or golodog of wood or bamboo(Department of Culture and Tourism of West Java Province, 2002).

West Java has various forms of traditional house buildings in each region. The diversity of the shape of this building adapts to the shape of the roof or the temperature. There are six West Java traditional houses that have different roof shapes (suhunan), namely the traditional house of Suhunan Jolopong, Suhunan Julang Ngapak, Suhunan Tagog Dog, Suhunan Capit Gunting, Suhunan Badak Heuay, and Suhunan Parahu Kumureb.*(Kustianingrum et al., 2013, p. 5)*. Behind the various forms of traditional houses, there are cultural values contained in them. These cultural values are based on the process of adjusting the shape of the house to local environmental conditions and are also based on patterns of life, beliefs and myths that grow and develop in the community. These cultural values must be learned by the youth as the next generation of the nation. So that they get to know their own cultural values, in this case the cultural values of the traditional houses of West Java.

The material about traditional houses is contained in the Social Studies (IPS) subject, starting to be studied in grade IV Elementary School, in the 2013 Curriculum Basic Competencies 3.2 and 4.2, as follows:

"Basic Competency 3.2: Identifying social, economic, cultural, ethnic, and religious diversity in the local province as the identity of the Indonesian nation; and its relationship to the characteristics of space. Basic Competence 4.2: Presenting identification results regarding social, economic, cultural, ethnic, and religious diversity in the local province as the identity of the Indonesian nation; and its relationship to the characteristics of space."(Ministry of Education and Culture, 2016, pp. 12-13).

Generally, the media used to study traditional house materials is media in the form of images or videos.

In the era of revolution 4.0, technological development in Indonesia has been growing rapidly. The development of this technology affects all aspects of life, including the education aspect. Technological developments require people to change their life patterns as a form of adjustment to the changing times(Akbar & Noviani, 2019, p. 20). In line with this, the teaching and learning process is also required to be able to adapt to technological developments as an effort to improve the quality of education. Along with the rapid development of technology, the use of technology in education is also increasingly diverse, one of which is Augmented Reality (AR) technology used in education. Augmented Reality technology is a technology that can combine a 3-dimensional virtual world with the real world(Arifitama, 2017, p. 3). The use of Augmented Reality has the opportunity to attract, arouse and motivate students to explore material from different perspectives (K. Lee inRoziqin & Astuti, 2019, page 2). The working principle of Augmented Reality (AR) is tracking and reconstruction(Mustaqim

& Kurniawan, 2018, p. 41). To run Augmented Reality, you need a marker which is generally a QR code or image. In this study, a flashcard-shaped image marker was used.

*Flashcard*is a picture card that can be used as a learning medium, this card has advantages including: (1) It does not require large space for storage, (2) easy to operate, (3) the display of flashcards containing images or text makes it easier for students to remember the material being studied. , (4) fun because with flashcards students learn while playing(Syatharia in Wicaksana & Anistyasari, 2020, p. 123). Flashcards on this media are equipped with Augmented Reality technology so that students can interact with images (2-dimensional objects) on flashcards and 3-dimensional objects displayed by the Augmented Reality application simultaneously.(Wicaksana & Anistyasari, 2020, p. 124).

In the subject of Social Sciences (IPS), one of the materials that can be developed in Augmented Reality technology is material about culture. In this study, the researchers focused on the material of traditional houses in West Java as a local culture that students must learn(Pramono, 2013, p. 123). The advantages of using Augmented Reality technology in West Java traditional house media, namely (1) Students can learn about West Java traditional houses in real or 3 dimensions, (2) provide ease of learning, namely students and teachers do not need to travel to the place of origin of the traditional house or making miniature traditional houses, (3) flexible media properties, students can learn anywhere and anytime not limited by space and time, and (4) enabling students to get interactive and fun learning experiences.

Based on the results of interviews with teachers, the use of media in the field in West Java traditional house materials is still limited to media images, videos and textbooks. The use of media that is less varied allows students to become bored or bored. Therefore, students need media innovations that are varied, interactive and can provide a more concrete learning experience so that learning is more meaningful and fun. Flashcards of West Java traditional houses based on Augmented Reality technology are an alternative media that can be used by teachers in teaching West Java traditional house materials in elementary schools. With the ease of learning and students' interest in the media, it is hoped that students can be more enthusiastic in studying West Java traditional houses as local culture that must be preserved.

METHOD

The final result of this research is in the form of a learning media prototype in the form of *flashcards and android-based applications. The method used for this research is the Design Based Research (DBR) method with the Reeves research model. The stages in this research are (1) identification and analysis of problems by researchers and practitioners collaboratively, (2) developing prototype solutions based on existing theories, design principles and technological innovations, (3) carrying out an iterative process to test and improve solutions systematically. practical, (4) reflection to produce design principles and improve the implementation of practical solutions*(Nurlaila & Hamdu, 2016).

This research was carried out to the second stage, namely:develop product prototypes based on existing theories, design principles and technological innovations. The first stage in this research is problem identification and needs analysis in the field through interviews, observations, and documentation studies to fourth grade elementary school teachers. Furthermore, the researchers conducted a literature study and analyzed various relevant sources to obtain data in the form of solutions to problems in the field, materials and theories that support the research. Then, the data that has been obtained is consulted with practitioners, namely class IV teachers, media experts and material experts. In the second stage, researchers design prototypes and develop products by referring to the data that has been obtained in the first stage, including

relevant theories, interviews, observations and documentation studies.*Augmented Reality*in the form of storyboards and Application User Interfaces

RESULTS AND DISCUSSION

Based on the results of interviews, observations and documentation studies at two schools, the researchers obtained several findings related to learning West Javanese traditional houses in grade IV Elementary School. The findings that the researchers obtained from the two schools have several similarities, including: (1) The media used in West Java traditional house learning is still limited to printed media images, videos and textbooks. These three media can only display 2-dimensional images which do not provide a real picture of traditional houses. In addition, in the use of media images, videos and textbooks, students tend to only see, watch or pay attention to the media without any direct interaction with the media and not infrequently the learning process is only one way. This tendency allows students to become bored and bored in learning. In addition, in the use of image media, the teacher only uses images printed on HVS paper, the durability of this media is not long and is easily damaged, requiring the teacher to reprint it when needed. The limited use of media in this school is due to the lack of media availability and the development of technology-based media in elementary schools. (2) The scope of the material studied by students is not deep and not all West Java traditional houses are studied, this is due to the lack of availability of complete and appropriate material sources. The teaching materials used refer to the 2013 Ministry of Education and Culture textbook, which includes materials for traditional houses in various regions in Indonesia, while materials for West Java traditional houses are very limited. (3) The teacher must look for materials for the West Java traditional house in other sources so that it is quite time consuming for the teacher to prepare the lesson. From these various problems, the teacher hopes that there will be media innovations that can facilitate teachers and students in the teaching and learning process of West Java traditional house materials, including interactive media, providing a more concrete, interesting and fun learning experience, containing complete material, permanent media. , practical and can be used by students when studying at home is not limited to only at school.

The findings of the problems and media needs in the field are used as a reference for researchers in developing media with reference to theories and findings from various literatures. In developing the media, the following points must be considered: (1) the concept and form of the media to be developed, (2) the basic competencies to be achieved, (3) the material on the media, and (4) evaluation(Mustaqim & Kurniawan, 2018, 43). The media designed as a solution to problems in the field is Augmented Reality-based flashcard media. This research refers to previous research as a reference in product design. Previous research used as a reference is research conducted bySaputra (2020)discusses the design of the Minangkabau traditional house based on Augmented Reality. This study contains the stages of designing a Minangkabau traditional house based on the Markeless Augmented Reality method (a method that does not use special images and text as markers). The design stages in this research are creating navigation structures, storyboards, and designing Unified Modeling Language (UML) which includes application use case diagrams, application activity diagrams and application display designs. Then, this research also refers to research conducted byRoziqin & Astuti (2019) which discusses the prototype for making volcanic disaster

mitigation based on Augmented Reality. The stages in this research are as follows: (1) prototype development, including marker design in Blender and Adobe Photoshop software which goes through several stages: (a) 3 dimensional object modeling, (b) object texturing, (c) texture implementation on objects, (d) rendering of 3-dimensional objects, (e) creating markers, (f) inserting markers into the Vuforia Developer software, (g) downloading databases, (h) inserting databases into Unity, (i) configuring in Unity, and (j) building designs be an application. (2) The last stage is product testing using the white box method.

Researchers use these references to reference the stages of designing an Augmented Reality flashcard prototype as a learning medium for West Java traditional houses in elementary schools. This product is designed to make it easier for teachers and students to teach and learn West Java traditional houses.

1. West Java Traditional House Augmented Reality Flashcard Design

The learning media in this study used flashcards with pictures of traditional houses as markers. The size of the flashcard is printed on A5 size art carton and with a thickness of 310 grams. The size of this flashcard is made larger so that students can see the picture or description on the flashcard clearly. Based on the researcher's experiment on 5 students with normal eye conditions, this flashcard can be seen clearly at a maximum distance of 4-5 meters. The top of the flashcard is given 13 holes which are used to store flashcards in a removable ring. The use of this ring can make it easier for teachers to use flashcards and practical storage.

a. Modeling and Texturing of objects

This stage is the stage of making West Java traditional house objects using SketchUP 2018 software. There are two types of objects created, namely 2-dimensional objects and 3-dimensional objects. The first design made is a 3-dimensional object for the display of Augmented Reality, then the 3-dimensional object can be converted into a 2-dimensional format as a marker on a flashcard.

The next stage is to give texture or color to each component of the house that is adjusted to the original material. The next stage is to download objects into a 3-dimensional format for Augmented Reality objects and into a 2-dimensional format for flashcard needs.

b. Marker Design

The flashcard design used consists of two sides, namely the front side and the back side. The front side has a picture of a different West Java traditional house on each card and is accompanied by the text title "West Java Traditional House", the front side of this card is a marker to bring up the 3-dimensional object of the traditional house. Then on the back side there is a description of the name of the traditional house on the front side of the card accompanied by the application logo. The back side is a marker to bring up information about traditional houses in general. The markers are designed in such a way that each card uses a different color, but for the front and back cover colors of the flashcards, the dominant color is blue as the main color for this media. Marker design using Canva software as shown in figure 1. In addition to flashcard designs,

Figure 1. Front and back side markers

2.Application Design of West Java Traditional House Augmented Reality

The application design process uses the Unity 2018.4.30F1 software (64 bit). This

application is named "Bilik" with a blue color theme combined with a contrasting button color, namely a combination of yellow, orange, brown and red. The design of the application in this study is as follows: (1) Able to present a real West Java traditional house or 3 dimensions in the application. (2) Equipped with information about West Java traditional houses in an application that can be displayed by scanning a flashcard marker, this information is also included on a piece of paper that is stored on the back cover of the flashcard as an optional or option for users in studying traditional houses according to the learning method used. desired. (3) The scope of information is quite broad and detailed, covering information on traditional houses in general and in particular (information on traditional houses by type). (4) there are several features, such as: (a) scale to enlarge or reduce the size of a 3-dimensional object of a traditional house in West Java, (b) info to display information about traditional houses in the form of text, (c) sound to display information on traditional houses in the form of sound. , (d) card scan is used to bring up the Augmented Reality of traditional houses with a scan marker on the front side of the flashcard and displays a video of information on traditional houses in general by scanning the back side of the flashcard, (e) the "3 Dimensional" menu is used to display traditional houses without the need for a scan. flashcard, (f) features front, back, right, left to display the custom house according to the selected position. This feature is only available in the "3 Dimensional" menu.

a. Augmented Reality Application Storyboard

*Storyboard*is a sketch or picture of an application that contains an overview of the appearance of each menu that is arranged in sequence(Saputra, 2020, p. 447). This application has 5 menus, namely the guide menu, about menu, start menu, card scan menu and 3-dimensional menu. The application design in this study uses a storyboard shown in the following figure:

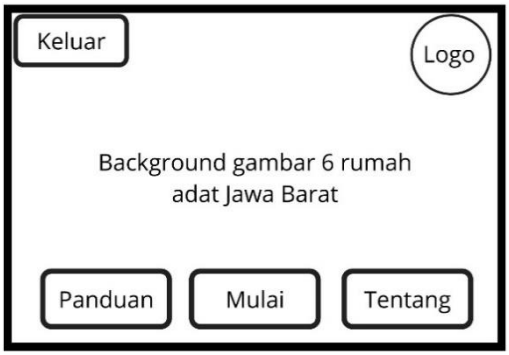

Figure 2. Storyboard of the main menu of the Bilik application

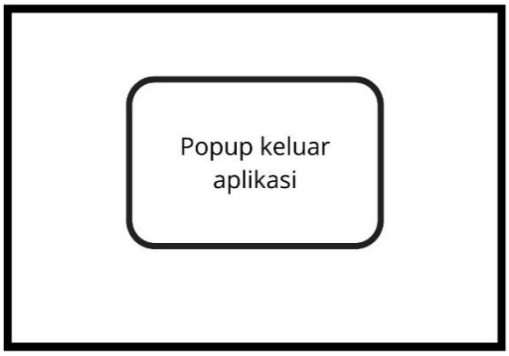

Figure 3. Storyboard popup out

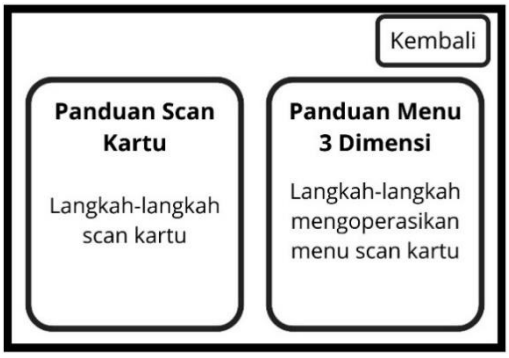

Figure 4. Storyboard menu guide

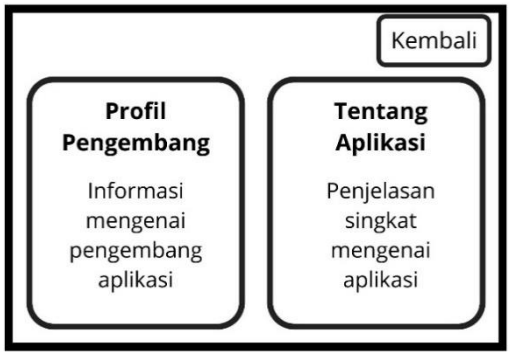

Figure 5. Storyboard menu about

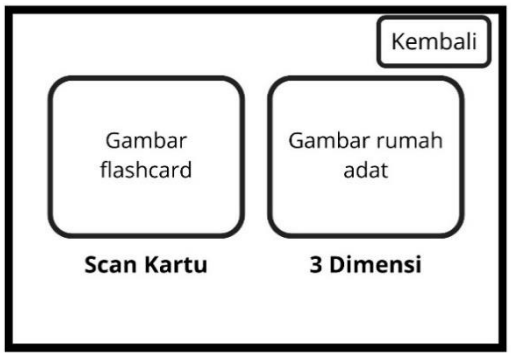

Figure 6. Start menu storyboard

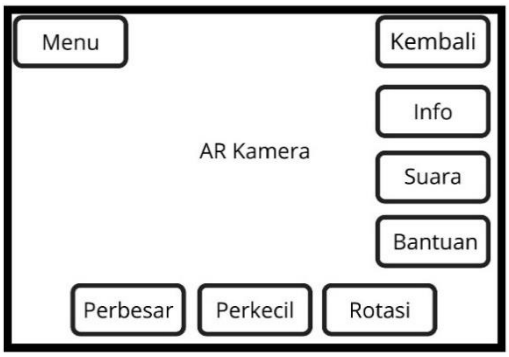

Figure 7. Storyboard card scan menu

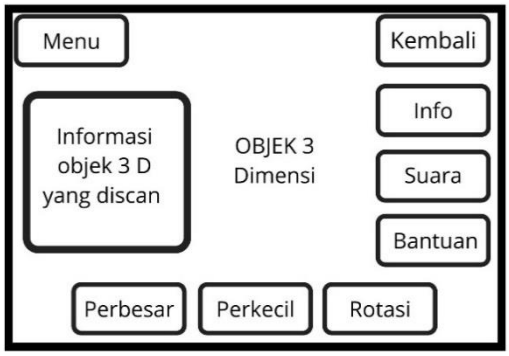

Figure 8. Storyboard info button

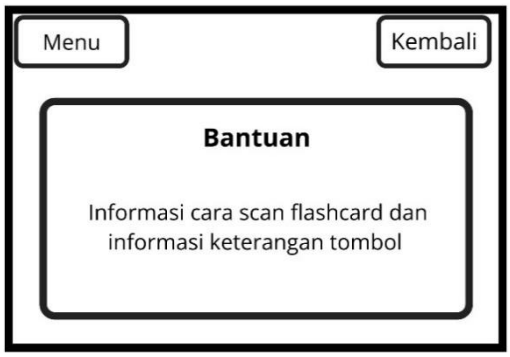

Figure 9. Storyboard of help button

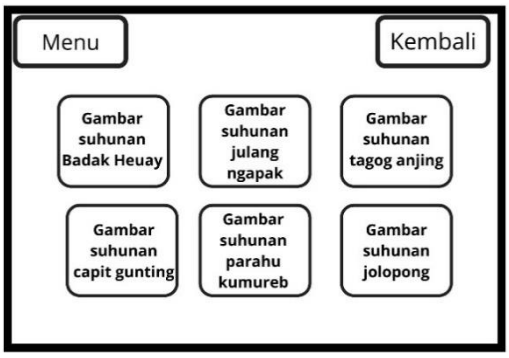

Figure 10. 3-Dimensional button storyboard

Figure 11. Storyboard when the user clicks one of the custom home buttons

b. User Interface of Augmented Reality App

The next stage in application design is to create a User Interface or display interface. The User Interface is the display design of each menu page as a reference for the actual menu display design in the application(Saputra, 2020, p. 448). The initial appearance of the User Interface of this application is the main menu page with a background of six West Java traditional houses equipped with the application logo. This User Interface is shown in Figure 12.

Figure 12. Main menu display design

In the "main menu" display, there are four buttons, namely the "guide" menu button located at the bottom left of the main application menu, the "start" menu button located at the bottom center, the "about" menu button located at the bottom right, and the "start" button. Exit" is located at the top left of the app's main menu. The exit button is symbolized by a cross (x). When the exit button is clicked, a popup will appear confirming whether the user is sure to exit the application. If the user clicks the check button on the popup then the user will exit the application, but if the user clicks the cross button on the popup then the user will be taken back to the main menu. Popup display as in Figure 13.

Figure 13. Design of the exit popup

The "guide" menu button serves to display a guide page containing the steps for scanning a card or flashcard and how to run the "3 Dimensional" menu. On this page there is a back button symbolized by an arrow facing left, which functions to return to the previous page (main menu). The "guide" menu display is shown in Figure 14.

Figure 14. Guide menu display design

The “about” menu button contains the developer profile and a brief description of the application. On this page there is a back button at the top right. The "about" menu display is shown in Figure 15.

Figure 15. The design of the menu display about

Figure 16. Start menu display design

Figure 16 shows the design of the "start" menu display, this menu serves to open the next menu page which contains three buttons, namely the back button, the scan card button and the 3D button. (a) The back button has the same function, namely to return to the previous menu. (b) Then, the card scan button located in the middle of the page functions to display the Augmented Reality of traditional houses (3-dimensional objects) by pointing the smartphone camera at the flashcard. When clicking the scan card button, the user will be immediately directed to the camera's AR page which is equipped with several buttons, as follows: information button (book symbol) to display information from the scanned marker, sound button (speaker symbol) to display information from the scanned marker. in sound, the help button serves to inform the steps for scanning the flashcard as well as the description of the button on this menu, the two scale buttons symbolized by the plus sign

(+) and minus (-) function to zoom in and out of 3-dimensional objects, the rotation button is used to rotate 3-dimensional objects up to 360 degrees, the back button functions to return to the previous menu page, and the menu button functions to return to the main menu. The display design on the card scan menu is as shown in Figure 17. the back button serves to return to the previous menu page, and the menu button functions to return to the main menu. The display design on the card scan menu is as shown in Figure 17. the back button serves to return to the previous menu page, and the menu button functions to return to the main menu. The display design on the card scan menu is as shown in Figure 17.

Figure 17. Card scan menu display design

Figure 18 is a display design when the user clicks the "3-dimensional" menu. The "3-dimensional" button is located next to the card scan button which has 6 main buttons and a "back" button and a "menu" button. These six buttons are square with the same size and have pictures of different traditional houses and are also equipped with descriptions of the names of the images. This button has the same function, namely to display the traditional house of West Java in various points of view, the only difference being the image of the traditional house. Users can choose whichever button they want. When users select one of these buttons, they will be taken to a new look with a natural nuance, as shown in Figure 19. On this page there are six buttons, namely the "back" button and the "menu" button as well as the four main buttons, namely the front, back, and buttons.

Figure 18. 3 Dimensional menu display design

Figure 19. Design of the page view of the Parahu Kumureb traditional house

c. Applications Used

1) Unity

Unity is a game development software, both 2-dimensional and 3-dimensional games that use the Javascript and C# programming languages.(Arifitama, 2017, p. 10). Unity can be used for free or paid, users with free licenses are free to publish applications made without having to pay a license fee to Unity, but users with free licenses cannot use certain features or bonus modules/prefabs provided specifically for paid users.(Sihite et al., 2013). This software has complete facilities, users can manage 3-dimensional, 2-dimensional objects, sounds, textures, and more(Sihite et al., 2013).

2) SketchUP

SketchUp is a software used for modeling 3D objects. This software makes it easy to operate and receive and send data to other

programs with fairly good quality (Darmawan in)Cahyanto & Handayani, 2018)

3) Canva

Canva is a software that gives users the freedom to do graphic design. This software is equipped with quite complete features, such as various types of fonts, illustrations, templates, and other features that facilitate the graphic design process.(Sholeh et al., 2020, p. 432). Canva can be obtained for free through the web and applications on android and desktop.

4) Vuforia SDK

Vuforia SDK is a SDK Development Kit software that is used as a supporting tool for developing technology-based applications such as Augmented Reality and Virtual Reality. Vuforia SDK has several features that can support the development of Augmented Reality including, scanning objects, scanning text, recognizing image targets and cylindrical objects, identifying object surfaces and other features.(Arifitama, 2017, p. 13).

5) Android SDK and Java Development Kit (JDK)

Java Development Kit(JDK) is a programming language that can be used for free on the Sun Microsystems web(Teguh Martono, 2011).

CONCLUSION

Teaching and learning activities in schools are required to be able to adapt to technological developments as an effort to improve the quality of education. One of the technologies in education is Augmented Reality technology which can be used as a medium of learning in elementary schools. The use of media in the field in Social Sciences (IPS) subjects for West Java traditional houses is still limited to pictures, videos and textbooks. The use of media that is less varied allows students to become bored or bored. Teaching and learning activities require varied, interactive media and can provide a more concrete, meaningful and fun learning experience. Flashcard Augmented Reality is an alternative media that can be used by teachers in teaching West Java traditional house materials in elementary schools. The main design of this media is capable of displaying 3-dimensional objects of traditional houses and object images from various points of view which are equipped with supporting features, such as complete information, sound, scale, rotation and other features. This media is in the form of a flashcard that is practical and does not require large space and applications that can be used on Android smartphones make it easier for users to operate it anywhere and anytime, not limited by space and time. With the ease of learning and students' interest in the media, it is hoped that students can be more enthusiastic in studying West Java traditional houses as local culture that must be preserved. rotation and other features. This media is in the form of a flashcard that is practical and does not require large space and applications that can be used on Android smartphones make it easier for users to operate it anywhere and anytime, not limited by space and time. With the ease of learning and students' interest in the media, it is hoped that students can be more enthusiastic in studying West Java traditional houses as local culture that must be preserved. rotation and other features. This media is in the form of a flashcard that is practical and does not require large space and applications that can be used on Android smartphones make it easier for users to operate it anywhere and anytime, not limited by space and time. With the ease of learning and students' interest in the media, it is hoped that students can be more enthusiastic in studying West Java traditional houses as local culture that must be preserved.

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