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Virtual Reality and Educational Game to Learn Madurese History and Alphabet For Elementary School Students

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Abstract: This development research aims to develop a learning media that collaborates virtual reality and educational game to learn Madurese history and alphabet. This learning media was created to facilitate the difficulties of 3rd grade students of Pangarangan III Elementary School of Sumenep in learning Madurese history and alphabet. This learning media is developed based on information technology that can bring students to an environment that seems real. This media also supports distance learning which is suitable for students to use in learning during the current Covid-19 pandemic. The development of this learning media uses ADDIE Model. The learning media that has been created are then tested with results of trials on media design experts is 91% (very high), trials on material or content experts are 84% (high), trials on individual users (three students) are 85% (high), testing trials in small group users (six students) was 87% (high), and trials in large group users (twenty students) was 86% (high). It can be concluded that the virtual reality and educational games are well worth it and no need to revise. The application of this media in learning will have an impact on increasing the effectiveness, efficiency and attractiveness of learning Madura history and alphabet.

1. Introduction

Information technology at this time has penetrated all areas of human life on earth, including in the field of education. Information technology that is applied appropriately in the field of education will have an impact on improving the quality of the process and the results of learning. As we know, one form of information technology in education is the emergence of the latest technology-based learning media to support learning activities. This technology-based learning media helps the role of the teacher in teaching both face-to-face learning in class and learning outside the classroom without face-to-face or independent learning by students.

This information technology-based learning media also has another important role in the conditions of the Covid-19 pandemic that Indonesia is currently facing. The spread of Covid-19 in Indonesia is entering an alarming stage where there has not been a significant decrease in the number of Covid-19 patients. The total number of Indonesians who have contracted Covid-19 is quite high, reaching 220,000 positive people for Covid-19 as of September 2020. The Covid-19 pandemic that is currently hitting Indonesia has resulted in the government issuing regulations in which to reduce the spread of the virus, schools have not been allowed to carry out face-to-face learning. Facing this situation, schools are asked to continue to carry out the learning process with a distance learning model without face to face.

Facing this situation, Pangarangan III Elementary School of Sumenep as an educational institution must of course follow government regulations regarding the distance learning process during the Covid-19 pandemic. But other problems arise related to the learning process, especially in subjects



related to Madurese History and Alphabet material in 3rd grade students of Pangarangan III Elementary School of Sumenep, such as:

1. The learning media for Madurese history and alphabet at 3rd grade students of Pangarangan III Elementary School of Sumenep is only in the form of textbooks, in which the textbooks are deemed not representative.
2. The teacher of the students in the 3rd grade of Pangarangan III Elementary School report that only 55% from all of the students in the class can reach scored above the minimum passing criteria in Madurese history and alphabet lessons.
3. There is no learning media for Madurese history and alphabet that keep up with the development of technology and information so that it does not attract student's interest to learn. With the advancement of technology, Electronic products are popular until virtual reality be created nowadays. They change the usual boring education and more colorful for education. In the practice drill, they can feel more profound experiences and find them interested in learning. They can also learn more. Let everyone know the convenience and impact of technology for education [1].
4. Continuous online distance learning will make it difficult for students because many students in remote areas have minimal internet access, so they need technology-based learning media that can be used without internet or offline access.
5. The rapid development of information technology has made students more fond of playing gadgets with applications that have no educational value, such as: *Tik Tok*, *Instagram*, or online games (*PUBG*, *Free Fire*, and *Mobile Legends*). We are now in the Experience Age – where 92% of teens are online daily, playing games, livestreaming memorable experiences, sharing ephemeral moments on Snapchat, or posting pictures of exciting daily occurrences on Instagram [2].
6. The habits of students in daily life such as the history and alphabet of the Madura region are being forgotten and lost due to eroded by the era of modern globalization.
7. Students find it difficult to visit Madurese museums or cultural sites due to long distances.
8. The results of an interview with Mr. H. Mohammad Erfandi, S.Sos., as the official at the Sumenep Palace Museum, stated that the number of visitors to the museum decreased drastically each month due to the impact of the Covid-19 pandemic.

Facing this situation, Pangarangan III Elementary School of Sumenep as an educational institution must of course follow government regulations regarding the distance learning process during the Covid-19 pandemic. But other problems arise related to the learning process, especially in subjects related to Madurese. From the problems that arise, it is necessary to take preventive action by developing learning media based on information technology and it is a current trend. Learning media that are currently in trend are virtual reality and educational games.

Technology of VR is not new; in the early decade of 1990's already existed. Started by Ford, he was using VR for design and production of its vehicles [3]. Technological advances that are increasingly developing make an information media now switch to Virtual Reality (VR) media [4]. Virtual Reality or virtual reality is a technology that allows users to interact with an environment that is simulated by a computer so that users feel they are in a virtual world [5]. Virtual Reality is a computer-based technology that combines special input and output devices so that users can interact deeply with the virtual environment as if they are in the real world. VR enables developers to create virtual environments with potential simulated ways [6]. However, at the time, VR used in various fields: traveling, everyone would wave their hands to do visiting in other places, converse with virtual people, and experience adventures in excellently simulated environments [7]. Virtual reality is a multimedia technology that has advantages in describing a situation in which the visualization displayed can be seen from all angles, because it has 3 visual dimensions so that users can interact with an environment simulated by a computer (Virtual Environment) [8]. Many aspects of VR give an opportunity to encourage student engagement. Such as Google Expeditions leaves teachers to transport students to virtual field trips to Mars and the bottom of the ocean [9].

Virtual Reality is a concept of interaction that is quite easy to use along with the development of mobile technology that can function as this medium [10]. Several VR roles such as simulation, interactive learning, promotion, and games are now increasingly being developed [11]. With this existing potential, this study uses VR technology to produce learning media. VR technology is poised to be disruptive and vastly influential – projected to be a trilliondollar industry by the year 2035 according to market researchers [12]. Already, developers have created compelling experiences allowing people to travel through the cells of the body, to explore the Solar System, and to encounter recreations of ancient battles in history [13-15]. Several characteristics of VR provide an opportunity to boost student engagement. As a hands-on, interactive, immersive experience, it provides a novel way of learning for students, delivering powerful new experiences they may not have encountered before [16].

Educational Games are games that are packaged with the aim of stimulating the thinking power of students and also useful for training in increasing the concentration of students as educational game users [17]. Games can be said to be quite effective when used as a learning medium because they can stimulate thinking and have a happy effect while learning. The conditions that are expected if the game is combined with education, then the game will make students more happy to play it and indirectly have studied the material contained in it [18]. Educational games are assumed to contribute especially to the development of the social aspects of students. It is important for the teacher to make the necessary preparations before the activity and to use the time actively during the activity in order to reach the objectives of the subject [19]. Based on this opinion, the game is very suitable when combined with the subject matter. So that this educational game can help students in the learning process. The trend of developing virtual reality learning media and educational games is also supported by several previous studies, namely as follows:

Table 1. Relevant previous research

<p>Author : Alan Cheng, Lei Yang, and Erik Andersen. Article title : Teaching Language and Culture with a Virtual Reality Game. Journal / Conference Name : CHI Conference. DOI: 10.1145/3025453.3025857. 2017. Findings: Therefore, we adapted Crystallize, a 3D video game for learning Japanese, so that it can be played in virtual reality with the Oculus Rift. Specifically, we explored whether we could leverage virtual reality technology to teach embodied cultural interaction, such as bowing in Japanese greetings. Our results suggest that virtual reality technology provides an opportunity to leverage culturally-relevant physical interaction, which can enhance the design of language learning technology and virtual reality games [20].</p>
<p>Author : Xena Rambing, Virginia Tulenan, and Xaverius Najoan. Article title : <i>Virtual Reality Berbasis Video 360 Derajat pada Tari-Tarian Adat Suku Minahasa</i>. Journal / Conference Name : E-Journal Teknik Informatika Vol. 11 no. 1. ISSN: 2301-8364. 2017. Findings: The author makes a 360-degree video-based Virtual Reality application on traditional Minahasa dance using the interactive multimedia system of design and development (IMSDD) method and google cardboard as a tool for video visualization. By applying this media, the interest in learning dance in Minahasa culture will be more interesting [21].</p>
<p>Author : Radi Rusadi Susanto, Febry Eka Purwiantono, and Koko Wahyu Prasetyo. Article title : Game ID Card Puzzle Berbasis Virtual Reality untuk Mengenalkan Kebudayaan Tradisional Indonesia. Journal / Conference Name : Journal of Information System for Educators and Professionals Vol. 3, No. 1. E-ISSN: 2548-3587. 2018. Findings: The content used in this game is local content such as traditional houses, traditional clothes,</p>

traditional weapons, traditional musical instruments and traditional dances. In accordance with the title of the game, the purpose of making this game is to develop an interesting, creative, and innovative virtual reality-based game so that it can be enjoyed and try to introduce Indonesian culture to users inside and outside Indonesia [22].

From the explanation above, it is important to conduct research on the development of learning media that supports the distance learning process. This learning media is aimed at 3rd grade students of Elementary School in Madura, where “Madurese History” virtual reality aims to introduce, preserve and instill student's love for Madurese culture. Then in the virtual reality there is also an “Halo Madura” educational game aimed at supporting the learning process in Madurese Alphabet Subjects to make it more effective, efficient, and interesting.

2. Methods and Equipment

The method used in developing the “Madurese History” virtual reality learning media and the “Halo Madura” educational game for 3rd grade students of Pangarangan III Elementary School of Sumenep uses the ADDIE model which is described in the Chart 1 [23].

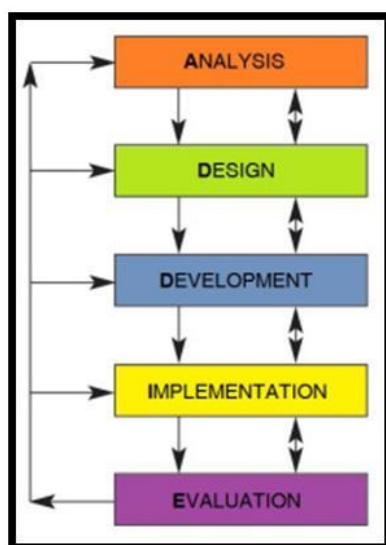


Chart 1. Stages of development ADDIE model

Table 2. Stages of development ADDIE model

Number	Stages Of ADDIE Model	Result
1.	Analysis	<ol style="list-style-type: none"> 1. Analysis of learning objectives: <ul style="list-style-type: none"> - Introducing historical heritage objects. - Know, understand, and identify words and sentences to write essays. 2. Analysis of material content: <ul style="list-style-type: none"> - Madurese historical objects. - Saying, writing shapes, and writing words in “<i>ghajang</i>” alphabet. - Changing the “<i>ghajang</i>” alphabet to Latin alphabet. 2. Analysis the characteristics of the 3rd grade students of Pangarangan III Elementary School focused on the learning styles of students who

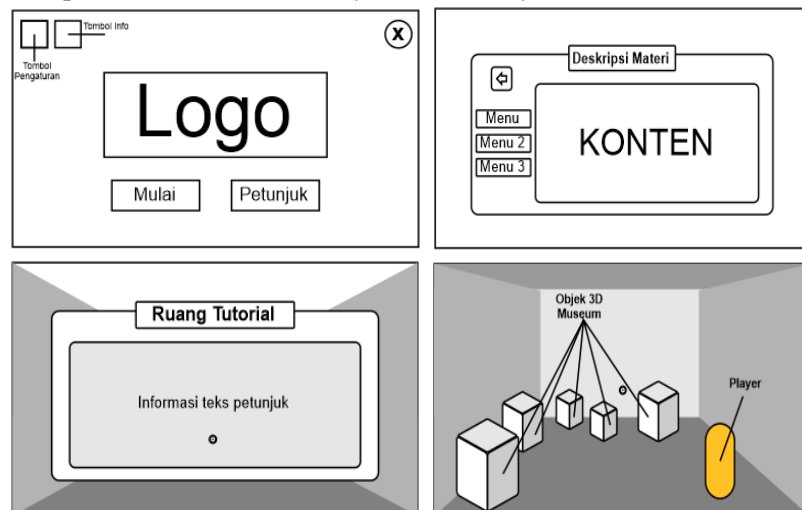
were identified as having various learning styles, namely visual, auditory, and kinesthetic. On this basis, it is necessary to develop learning media that can facilitate the three student learning styles so that all students can learn maximally according to their respective learning styles.

3. Analysis of the learning environment for the 3rd grade students of Pangarangan III Elementary School:

- Learning media in the classroom is still limited to the use of textbooks.
- There is no supporting learning media that is interactive, effective, efficient, and attracts student learning interest.
- Face-to-face distance learning process during the Covid-19 pandemic.
- There needs to be learning media that are innovative, effective, efficient, attractive and can support distance learning.

2. **Design**

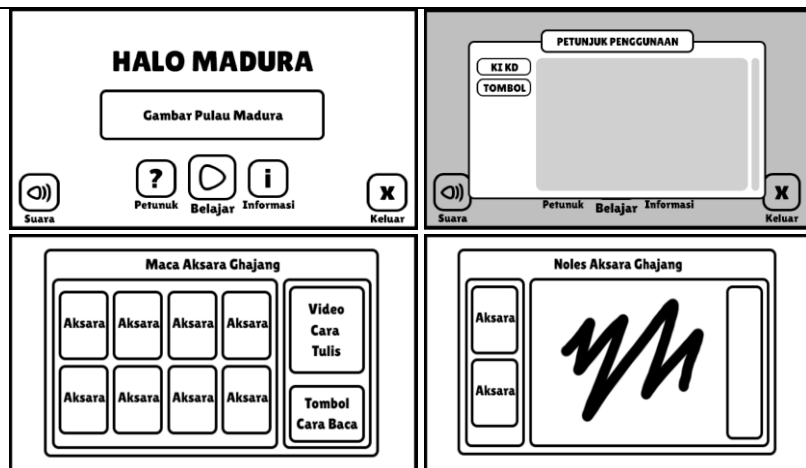
Blueprint of Madurese History virtual reality.



Notes:

- | | | |
|---------------------------|---|-------------------------------|
| - Tombol pengaturan | = | "Settings" button |
| - Tombol info | = | "Info" button |
| - Logo | = | Logo |
| - Mulai | = | Get started |
| - Petunjuk | = | Hint |
| - Deskripsi materi | = | Description of the material |
| - Menu | = | Menu |
| - Konten | = | Content |
| - Ruang tutorial | = | Tutorial room |
| - Informasi teks petunjuk | = | Instructions text information |
| - Objek 3D | = | 3D objects |

Blueprint of "Halo Madura" educational game

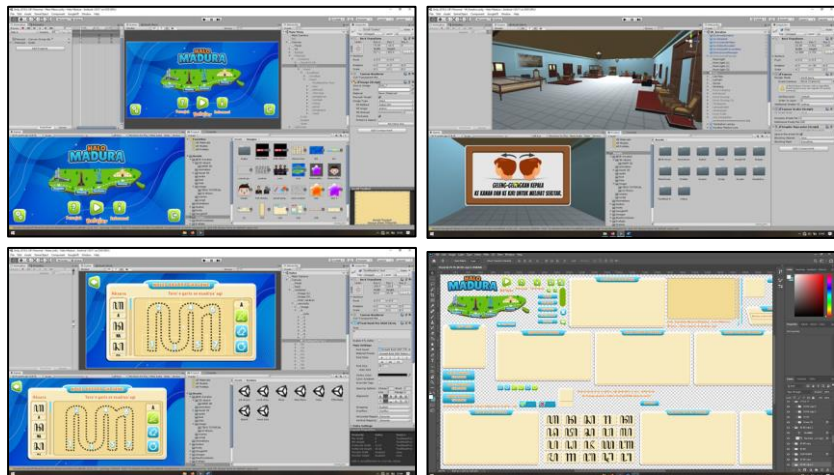


Notes:

- | | | |
|------------------------|---|---------------------------------------|
| - Gambar pulau Madura | = | Madura island image |
| - Suara | = | Sound |
| - Petunjuk | = | Hint |
| - Belajar | = | Learn |
| - Informasi | = | Information |
| - Keluar | = | Exit |
| - Petunjuk penggunaan | = | Instructions for use |
| - KI KD | = | Basic competencies |
| - Tombol | = | Button |
| - Maca aksara gajhang | = | Read "gajhang" alphabet |
| - Aksara | = | Alphabet |
| - Video cara tulis | = | Video how to write "gajhang" alphabet |
| - Tombol cara baca | = | "How to read" button |
| - Noles aksara gajhang | = | Write "gajhang" alphabet |

3. Development

The process of realizing a product from a blueprint that has been designed using several software, namely: Unity, Corel Draw X7, Adobe Photoshop, Blender 3D, and Camtasia Studio.



The equipment used in this stage is a computer, VR box and controller, camera, microphone and speaker.

4. Implementation

Implementation and product testing of validators and users.



5. **Evaluation** Calculation of the feasibility of learning media development products.

3. Result

From the results of the development that has been made, the next step is to test the feasibility of a product to determine the effectiveness, efficiency and attractiveness of the media by using a questionnaire that has been prepared. Filling in the questionnaire using a scale of five ratings of products, namely: (1) Very low, (2) Less High, (3) High Enough, (4) High, (5) Very High. After the questionnaires were collected, each question in the questionnaire will be calculated according to the percentage formula [24] are as follows:

$$\text{Percentage of answers} = \frac{F}{N} \times 100\%$$

Information:

F = The total value of the respondents

N = Total the maximum value

Results of the analysis of this data is used to revise the product development, evaluate the product, and provide further advice on the use and development. The results of data analysis on the learning media developed can be explained in Table 3.

Table 3. Calculation of product feasibility sresults (evaluation stage)

No.	Step	Subjects of feasibility test	Feasibility test results
1.	Media design expert validation	Laili Cahyani, S. Kom., M. Kom. (Lecturers of Informatics Education Study Program)	91% (Very High)
2.	Material/content expert validation	Andilala, S.Pd.SD. (Madurese Culture Teacher at Pangarangan III Elementary School)	84% (High)
3.	Individual trial	Three of 3rd grade students of Pangarangan III Elementary School	85% (High)
4.	Small group trial	Six of 3rd grade students of Pangarangan III Elementary School	87% (High)
5.	Large group trial	Twenty of 3rd grade students of Pangarangan III Elementary School	86% (High)

The basis for the results of the feasibility test for learning media is based on the conversion of the achievement level with a scale of 5 as described in the Table 4.

Table 4. Conversion of Achievement Levels and Media Qualifications

Level of Achievement	Qualification	Information
90% - 100%	Very high	Very feasible, no need to revise
75% - 89%	High	Well worth it, no need to revise
65% - 74%	High enough	Feasible, needs to be revised
55% - 64%	Less high	Not feasible, needs to be revised
0% - 54%	Very low	Not very feasible, needs to be revised

4. Discussion

Besides being suitable for use, this Madurese history VR media can overcome the limitations of space and time for students who want to learn history. Students do not need to come all the way to the museum to see Madurese historical objects. VR makes it possible to visit any location, time, or person in a relatively inexpensive way via virtual field trips. This creates powerful learning opportunities for experiencing historical contexts, scientific environments, and personally meaningful moments [25]. Another advantage of VR media is that it can take students as if they are in a museum and take a walk around the museum to see Madura historical objects. Chris Milk, one of the foremost 360° film directors, argues that VR makes anyone and anywhere feel local [26].

The results of the feasibility of the educational game developed have shown the feasibility level in effectiveness, efficiency and attractiveness. The students showed high enthusiasm for learning when they learned to use this "*Halo Madura*" educational game. A number of modern works are devoted to game-based learning assessment and methods for evaluating the quality of training. Studies of the last five years demonstrate a significant increase in motivation, attraction and interest of students of all ages in the learning process using this technique [27-29]. This "*Halo Madura*" educational game provides unlimited opportunities for students to continue to learn repeatedly about the Madurese alphabet. With this media, students no longer only read text books but students are given the opportunity to simulate how to write the Madurese alphabet repeatedly. The element of play in this media, apart from being entertainment, also functions as a strengthening of the Madura alphabet material for students. In this sense, [30] affirms that Educational Digital Games are games that provide, to students, the opportunity to reinforce some previous knowledge by repeating it in a more comfortable and ludic environment. Even though the definition of [30] limits the use of EGs to reinforce some already acquired skill, many authors agree with not so limiting definitions; games are usually presented as effective, engaging tools that could support active learning, experimental learning and problem-based learning [31][32].

The final results of the Virtual Reality learning media product "Heritage Objects" and the "Halo Madura" educational game are as described in the Table 5.

Table 5. Learning Media Development Products.

No.	Screenshot of Learning Media
1.	<p>Homepage Learning Media</p>

The home page displays a screen at the bottom of which there are two menu buttons for options to enter virtual reality or educational game.

No.	Screenshot of Learning Media
2.	“Madurese History” Virtual Reality

“Sumenep Palace Museum” VR



This is the display when the user selects the "virtual reality" button on the start page. In this section the user uses the VR Box and controller for control in the virtual museum room. Users will feel as if they are inside the Sumenep Palace Museum room and can see Madurese historical relics. Users are given the freedom to walk around to historical objects in the museum. This virtual space is made as closely as possible to the original conditions so that users can really experience entering the museum space and seeing relics. In each object approached by the user, there is information that the user can read to increase the user's insight into historical heritage objects in Madura. This experience cannot be provided by books or two-dimensional images, with virtual reality users will feel they are in a museum and see historical objects in three-dimensional form.

3.	“Halo Madura” Educational Game
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This is the display when the user selects the "educational game" button on the home page. In this section, users no longer need to use the VR Box and controller, users will be given material about Madurese Script and how to use these characters for words in Madura. Users will be given knowledge from the start, namely how the Madurese script forms. Then the user will learn firsthand about how to write Madura script correctly. Furthermore, users will get experience and training on writing

No.	Screenshot of Learning Media
	Madurese words using the Madura script. In this part of the educational game the user will play word games in Madurese using the Madurese script in several difficulty levels. In this educational game, it is hoped that users can write Madurese words both from Latin letters to Madurese script form and vice versa.

5. Conclusion

The result of this development is to obtain an effective learning media that replaces the role of textbooks and can improve the learning process so that students' grades are expected to increase. This learning media also shows the results that are interesting for students to use in learning. This media allows learning to be done remotely without coming to the object to be studied. This media can also divert students to not only play other games that are entertainment in nature which has become a trend among children, especially elementary school students. This media provides experiences to students that learning can also be done while playing.

With this media, it is suggested that the distribution of learning media products be carried out to all elementary schools in Madura Island. This distribution is carried out so that all elementary schools in Madura, both in the city center and in remote areas, can enjoy technology-based learning related to Madurese culture and the alphabet. Students in primary schools in Madura are expected to be able to get to know Madura culture and the alphabet even though they have not been able to come directly to historical sites that are scattered on the island of Madura.

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