Development Augmented Reality (AR) Learning Media for Pencak Silat Course at Faculty of Sports and Science Universitas Negeri Padang

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Article History	Abstract
	Learning activity must contain aspects of practicality, attractiveness and could motivate student, to facilitate the implementation of learning. Interesting learning media and effective also very necessary for students in the pencak silat course at the sports science faculty which contains practical and theoretical material. It should be considered in the selection of media, namely learning objectives, effective, easy to obtain, flexible use and able to visualize something abstract into reality. One of the developments of learning media that is currently still new is learning media using Augmented Reality (AR). AR is a technology application that can present virtual objects in virtual 3D in real form and presented in real time, then be able to present abstract concepts more real. The purpose of this research is to produce pencak silat learning media in terms of practicality aspects, attractiveness and validity. The research development model uses Borg and Gall, with the following stages: (1) Data collection; (2) Planning (3) Development; (4) Design Validation (5) Design Revision (6) Product Trial (7) Product Revision (8) Usage Trial (9) Product Revision (10) Mass production. The results of the study according to the results of expert validation on the development of Augmented Reality-based pencak silat learning media showed very good results and were suitable for use as learning media. The average acquisition of validation results by experts is 91.8%. Student responses to the use of this media in learning pencak silat were very good with scores in the small group trial of 89.97% and the large group trial of 87.15%. Conclusion hfinal result this finding in the form of learning media Augmented Reality in martial arts courses that are valid, practical and effective. **Keywords:** Augmented Reality, Learning Media, Pencak Silat.

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1. Introduction

The industrial revolution is a major change in the field of technology that causes changes in various fields, where advances in information technology can integrate in the world of life with digital which can have an impact on scientific disciplines. Currently, the industrial revolution has reached a higher stage called the industrial revolution 4.0. In this era the system is directed at digital forms assisted by networks. Technological developments in the 4.0 Industrial Revolution, especially information and communication technology, offer many conveniences in the learning process. (Verawadina, et, al, 2020); (Krismadinata, et, al, 2020); (Hendriyani, et, al, 2020). One trend of learning media that is starting to be noticed in the world of education is media with Android-based Augmented Reality (AR) technology (Aripin 2018). AR according to The New Media Corsortium in Vega (2017) is the incorporation of digital information including 3D models, images, video and audio into real world space. AR aims to blend reality with virtual environments, allowing users to interact with both physical and digital objects. By utilizing AR technology, books that have been used for conventional learning media can be added to their functions with AR media which will display 3D animations that are displayed virtually on mobile phone devices. Through learning media, it is hoped that teachers can be more creative and innovative in providing learning materials to students. So that students can learn pencak silat in a fun and interactive method.

Problems that occur in students, especially when a fighter trains, he must remember the silat movements one by one, in remembering these movements the fighter cannot just repeat one or two times. In addition, for independent study without any help from the trainer/lecturer, it will be difficult, because there are only material books without any movement props. Many digital technology-based learning media have been widely produced, but learning media are produced without understanding the lecture syllabus and student needs. Condition the bring thoughts for researchers to give how to present the material by utilizing existing facilities. With the use of current technological developments, researchers try to develop AR-based digital technology learning media designed as attractive as possible. This learning media can be studied by students anywhere, anytime and there is no time limit to study so that an effective and efficient learning process will be created and allow students to explore more in Pencak silat courses, and can increase motivation and learning outcomes. In this study, the learning media developed was pencak silat learning with basic technical material. Pencak silat is one of the original Indonesian martial arts, which was inherited by our ancestors as the culture of the Indonesian nation so that the culture of the Indonesian nation needs to be preserved, fostered and developed (Kriswanto 2015).

The use of Augmented reality technology is expected to be able to display objects in the form of movements in 3D virtual martial arts learning using images that are used as markers. The marker detected by the camera on the android smartphone will display a 3D object of pencak silat techniques, so that application users can observe how the basic movements of pencak silat move in real time. Making this application is built using Unity 3D and Blender software. AR technology is related to graphic design and related to multimedia. Broadly speaking, Augmented Reality is a combination of real and virtual objects that are well and clearly integrated. In a learning process, new innovations are needed, especially in the use of technology and media development. Technology is a means that allows the creation of the necessary learning environment in which the learning process can be realized in the most effective way (Kiryakova et al,. 2018:564).

By looking at the cognitive stage development experienced by students, AR technology may be preferred in learning, especially in teaching abstract concepts (Srikaya et al., 2018:309). In Sural's opinion (2018: 575) more research and learning materials need to be developed with AR technology and then implemented in the learning process. Because with the development of AR technology, it can help the learning process more optimally. Based on these complex problems, it is necessary to develop an AR technology-based learning media to support skilled students in learning pencak silat courses, based on technology concepts and 3D models that are suitable for student learning needs and courses.To develop AR media, the necessary technology and 3D models must first be prepared and the appropriate framework must also be considered. AR has a unique ability that can affect the learning experience of students. The development of AR technology allows researchers to develop and evaluate learning experiences by utilizing augmented reality (Dutta, 2015). By using various methods, technologies and tools, different types of AR can be developed. In this case future research may focus on which application is most suitable, if the targetare students (Gun et al., 2017:47). Therefore, researchers develop AR learning media to support learning.

This study aims to develop a learning media that is more attractive and efficient by utilizing Augmented Reality (AR) technology. The importance of this research is to overcome the learning of pencak silat and provide learning solutions through effective virtual technology.

2. Method

The method used in this research is Research and Development (R and D). This R and D Method can be used by researchers including to find a model or product or to develop any model. The concrete product is a learning media product based on Augmented Reality (AR) technology for pencak silat courses. According to Borg and Gall (1983:772), Educational Research and Development (R&D) is a process used to develop and validate educational products. Then Sugiyono (2011) suggests a series of development research steps which include the following 10 steps: (1) Potential and problems; (2) Data collection; (3) Product design; (4) Design Validation; (5) Design revision; (6) product trial; (7) product revision; (8) trial use; (9) product revision; (10) Mass production.

In the research and development of Augmented Reality (AR) learning media, the Pencak silat course resulted in a product application of learning media for the basic techniques of pencak silat that had been validated. The validation stage of the learning design experts includes aspects of media quality, technical quality and display quality. Validation by media experts includes aspects of the quality of media content and aspects of media display quality. Meanwhile, material experts provide validation on aspects of content and aspects of material accuracy. Product trials were carried out as a whole, namely students who took pencak silat courses to see student readability and observe student responses to the use of Augmented Reality-based learning media applications.

The prototype stage begins with conducting a needs analysis (need assessment) and then developing a prototype of pencak silat learning media using Android-based AR technology. At this stage, the flowchart, stoyboard, and Android-based AR application design, Marker, and Marker Books are arranged.

At this stage of making the prototype, markers and marker books were also developed which contained material for the sub-concept of Pencak silat Learning in accordance with the lecture syllabus, which could be scanned using the AR application that had been developed with the marker. The markers that are made are collected in the Marker book, in the Marker book section, apart from markers that can be scanned using AR media applications, materials and demonstrations of pencak silat techniques are also available.

Data collection was carried out in this study using (1) a questionnaire: aims to determine the validation of the feasibility of the product used for learning and to determine the student's response to the product development. Questionnaires were given to material experts, design experts, media experts and students: (2) Documentation: to strengthen the data obtained from the results of the questionnaire.

Data analysis techniques were carried out to obtain learning media that were suitable for use and met the validity criteria. The assessment of the results of the expert test was carried out based on the data using a Likert scale with a score of 1.2.3.4.5.

Table 1. Likert Scale

No	Category	Score
1	Very Worthy	5
2	Worthy	4
3	Decent enough	3
4	Not worth it	2
5	Not feasible	1

Sumber: (Sugiyono, 2011)

The results that have been obtained in the form of percent are converted back into qualitative form according to the rules that have been described to determine the eligibility category of learning videos. The results of the expert test can be declared feasible if it meets the minimum category that is feasible.

The research flow chart from the beginning to the end of the research can be seen in the following chart:
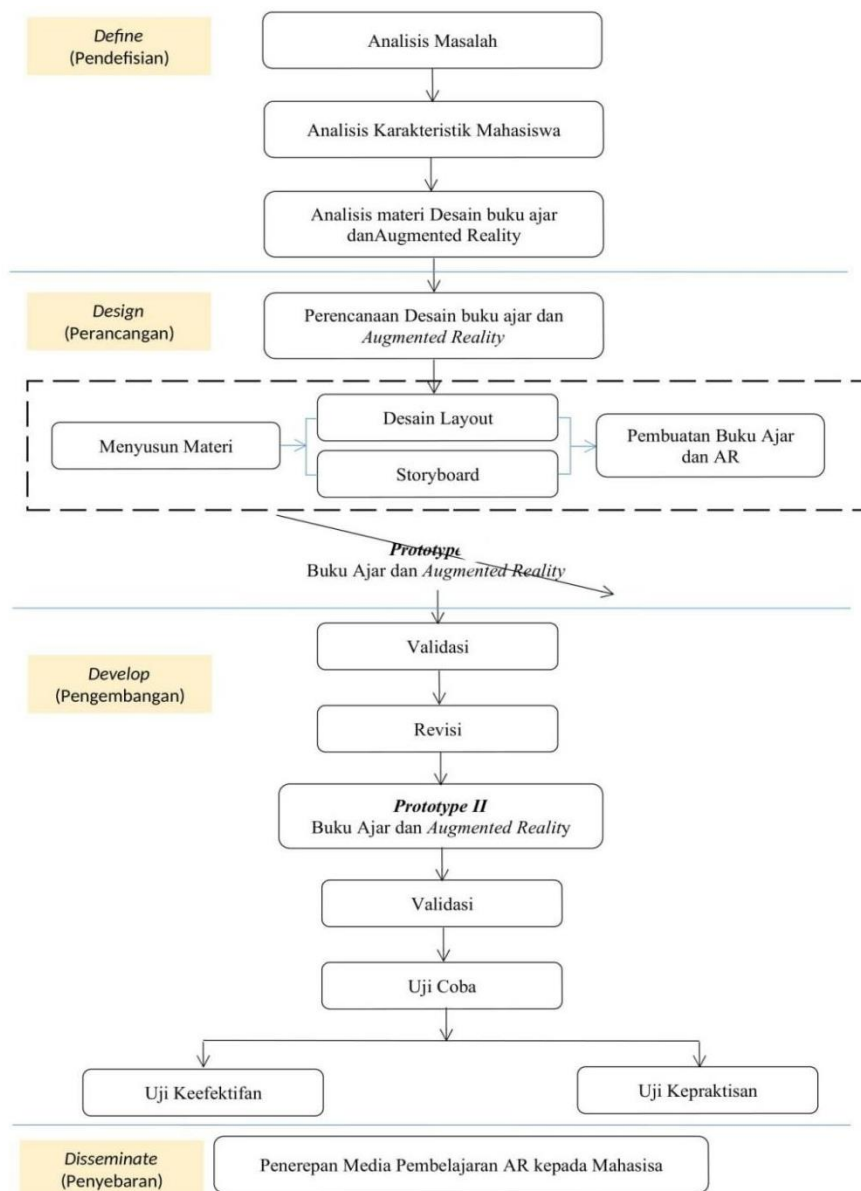
Figure 1 Flow Diagram

3. Results and Discussion

This research was conducted in June-September 2021 at the Faculty of Sports Science, Padang State University. This Augmented reality-based educational media was developed with the Research and Development Model Borg & Gall includes ten steps, namely:

(1)   Research and Information collection (research and data collection). Based on the results of initial observations that have been described in the background, the initial stage of development is data collection by conducting the following analysis: (a) market analysis, (b) user analysis (c) material analysis (d) analysis of facilities and infrastructure.

(2)   Planning, at this stage the plan includes media content that will be made as needed, product design plans, marker plans made and media implementation plans.

(3)   Development, this augmented reality media was developed with a waterfall model from the requirements, design, coding, testing and maintenance stages.

(4)   Media validation, media that have been validated by experts, namely design experts, media experts and material experts.

In the pencak silat learning media product, the material developed is the basic techniques of pencak silat, including basic attitudes and movements of pencak silat, basic defense, advanced defense which is equipped with pictures, descriptions and videos on how to perform basic techniques in pencak silat. The following is an example of an experimental process in the Unity application
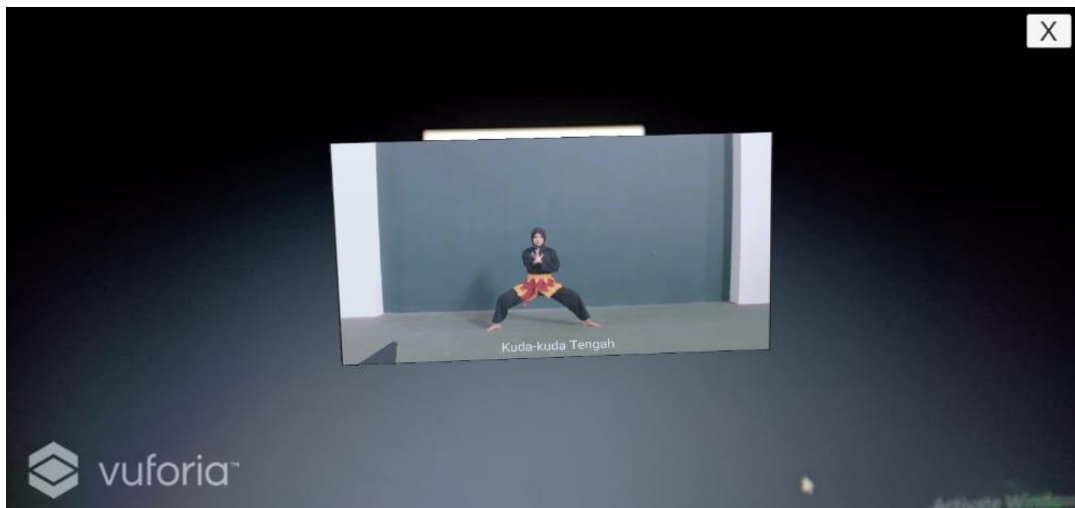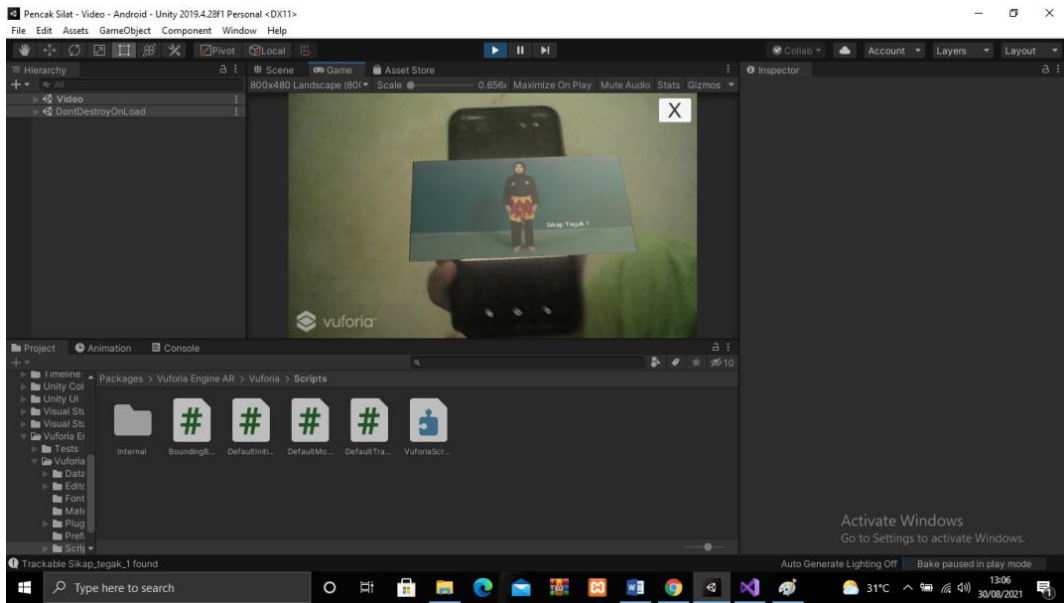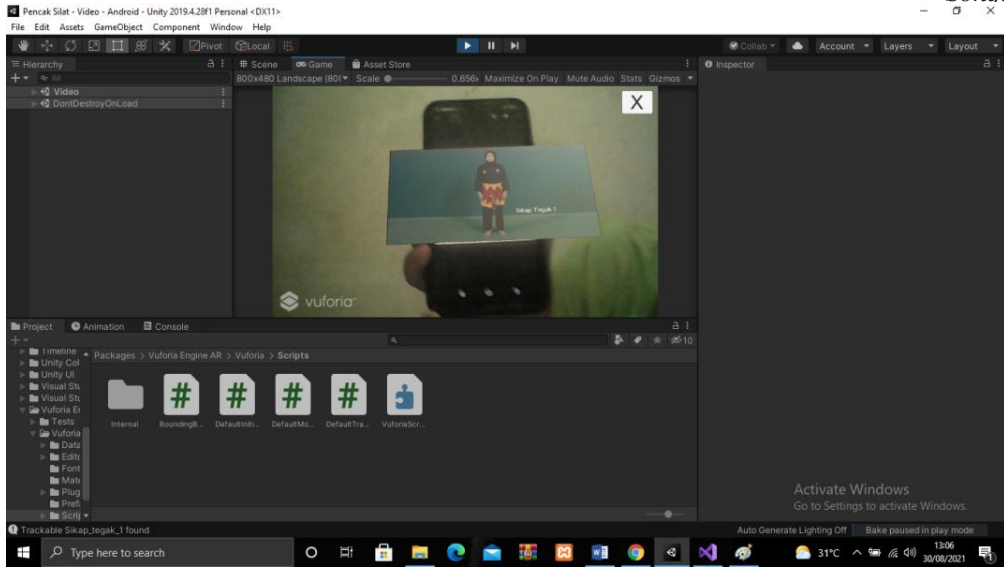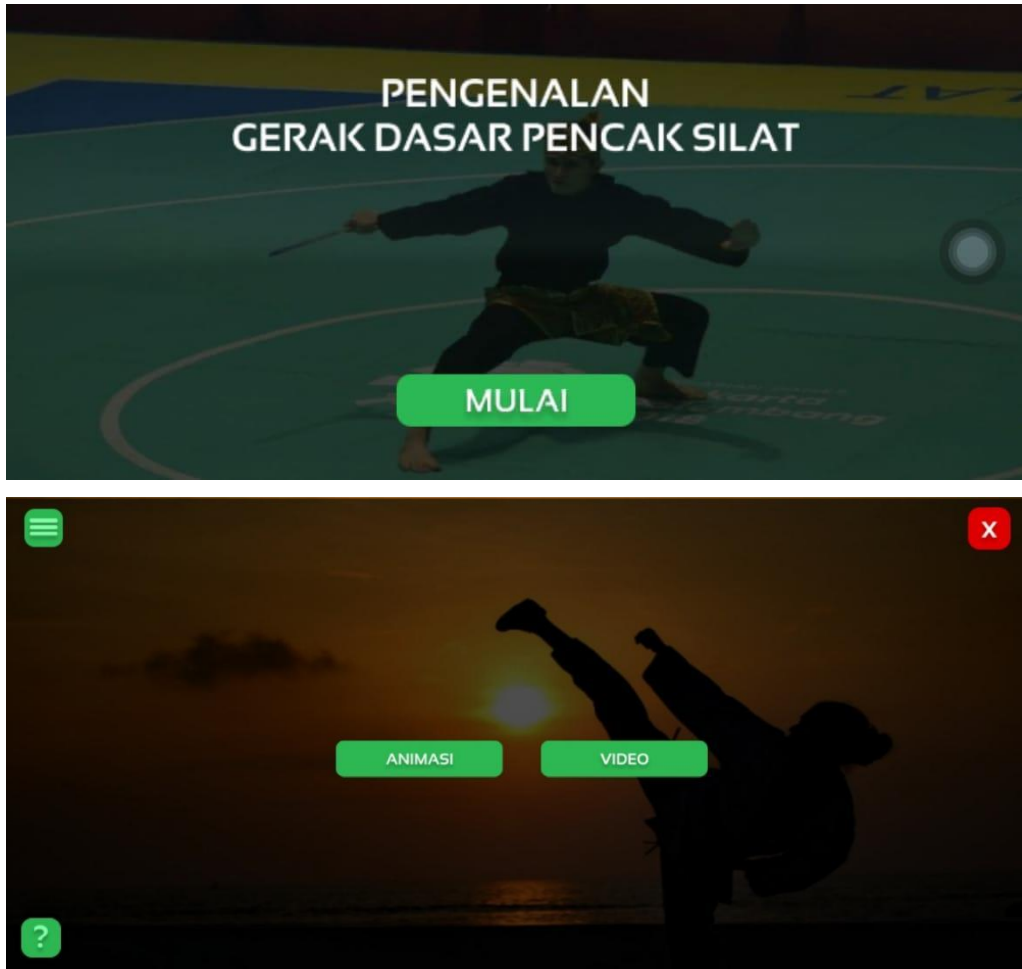
Gambar 2. Hasil Aplikasi

It is equipped with an Augmented Reality application barcode scan that can be used by students.
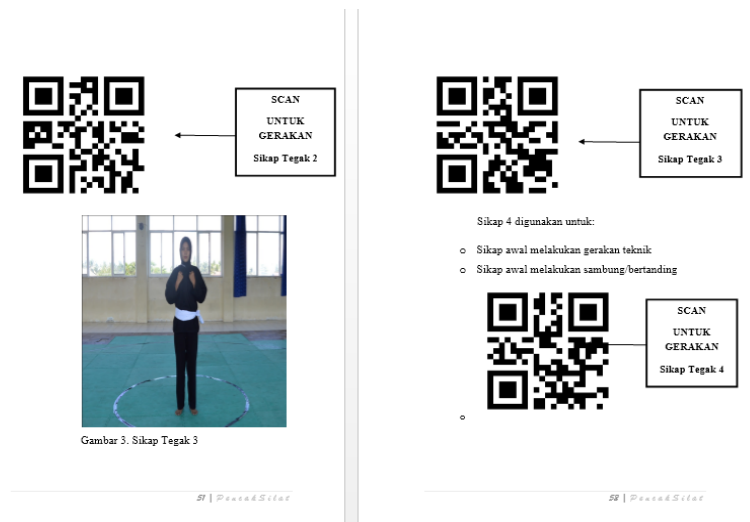

Figure 3. Barcode Using App

The results of the validation by design experts showed a total score of 88.5%. Aspects assessed by design experts included aspects of the quality of media content, appearance and presentation. With the total score and the average score for each aspect as shown in table 2 below:

Table 2.Learning Design Expert Assessment Results

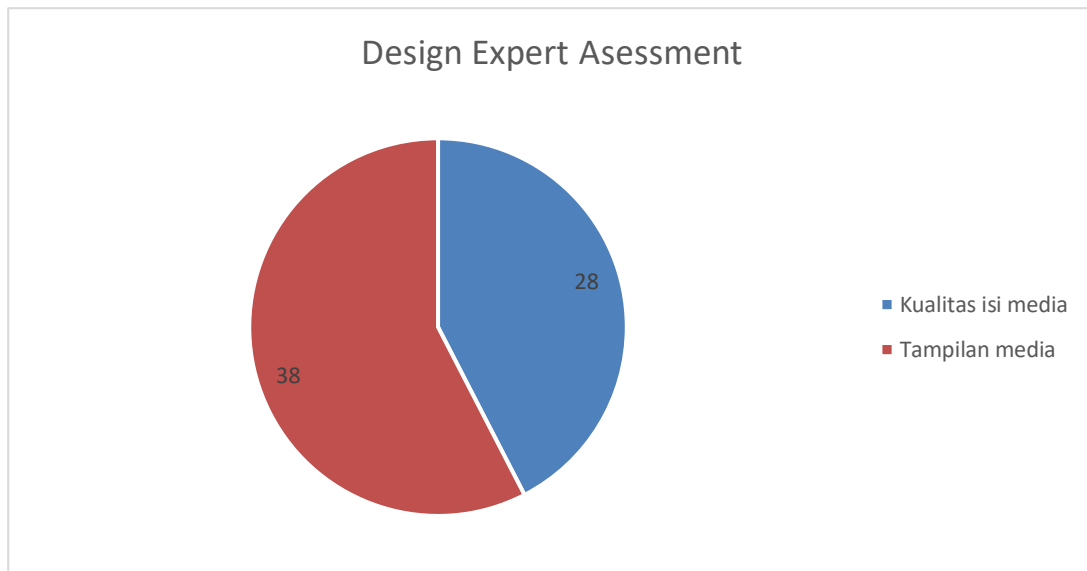| ...rbel	...ax Score	...ore	%	...scription
...dia content quality	30	28	93.3%	...ry good
...dia display	45	38	84.4%	...ry good
...erage score			88.5%	...ry good

Figure 4. Lecturer Assessment Results Chart

Based on table 2, it is known that Augmented Reality (AR) learning media is included in the "Very Good" category in terms of media quality and media display.

The results of media expert validation showed an average score of 96.6%. Aspects that are assessed are aspects of media quality, technical quality aspects, and display aspects. With the average score of each aspect as shown in table 3 below:

Table 3. Media expert validation results

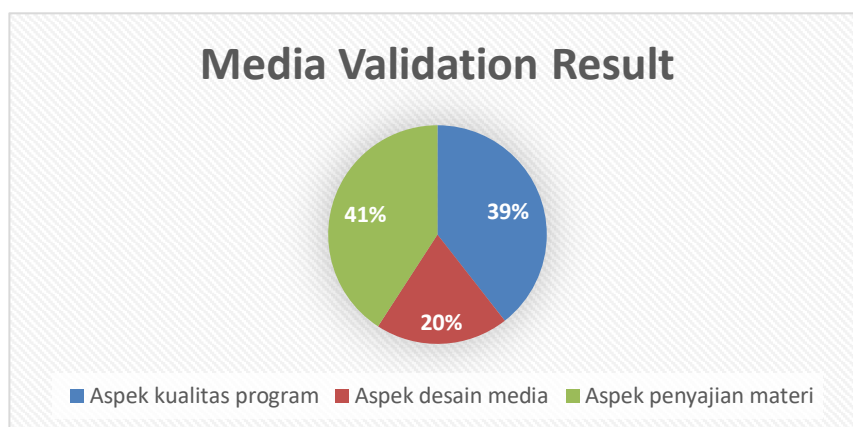| Variable	Max Score	Score	%	Description
Program quality aspect	30	28	93.3%	Very good
Media design aspects	15	14	93.3%	Very good
Aspects of material presentation	30	29	96.6%	Very good
Average score			94.6%	Very good

Figure 5. Media Validation Results

Based on table 3, it is known that Augmented Reality (AR) learning media is included in the "Very Good" category in terms of media quality, technical quality, and display aspects.

The results of the validation of the lecturer as a material expert showed an average score of 90.4%. Aspects assessed by material experts include aspects of content and material. The results of the validation state that the product is very good. With the total score and average score of each aspect as shown in table 4 below:

Table 4. Material Expert Assessment Results

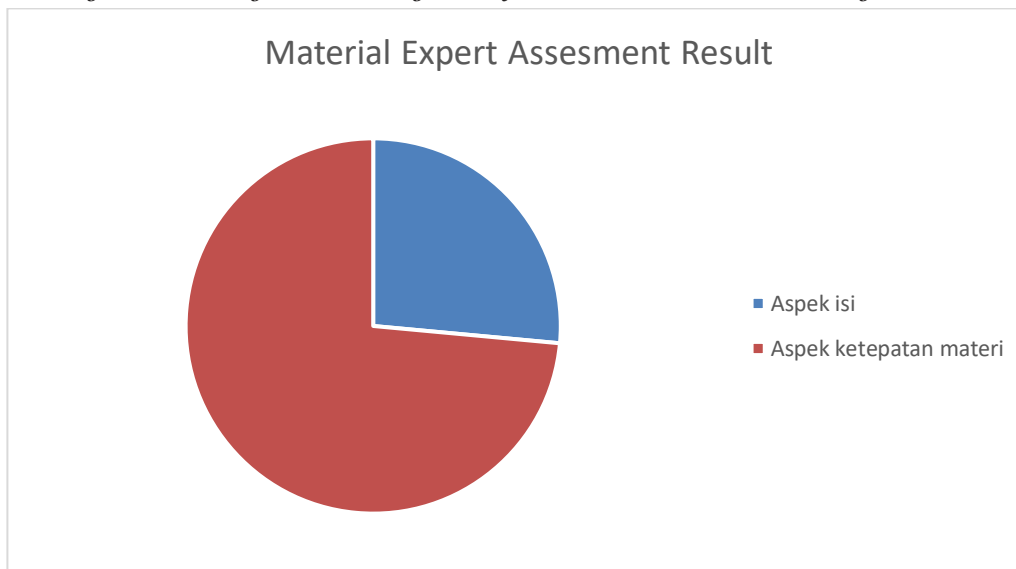| Variable	Max Score	Score	%	Description
Content aspect	20	18	90%	Very good
Aspects of material accuracy	55	50	90.9%	Very good
Average score			90.4%	Very good

Figure 6. Material Expert Assessment Results

Based on the data above, the average score of validation by design experts, media experts and material experts is 91.8% with a very good description, meaning that the media can already be tested in the test class with suggestions or minor revisions before the test.

(5) Product revision, this revision was obtained from the input of experts.

(6) Application of media in the test class.

The number of participants in the trial class was 20 students. Participants in these trials were no longer included in large-scale trials. Based on the results of small-scale product trials on Augmented Reality-based pencak silat learning media products at the Faculty of Sports Science, Padang State University, it is classified as very good (89.97%) with a statement that it needs revision.

(7) Product revision, refined again when there are still product problems.

(8) Large scale trial. In large-scale trials carried out for the experimental class, while for the small group class did not receive treatment.

Table 5. Large Group Test Assessment Results

Variable	Max Score	Score	%	Description
Aspects of product outcomes and aspects of effectiveness for students	40000	34862	87.15%	Very good
Average score			87.15%	Very good

Based on table 5, the product results according to the average student assessment are in the very good category with a percentage of 87.15%. Through this description, it can be concluded that the content of Augmented Reality-based Pencak silat learning media is obtained which effectively helps students in learning.

(9) The ninth step is the revision of the final product.

(10) Mass production and implementation stage.

At the development stage, a Pencak silat learning media based on Augmented Reality technology is produced, complete with a marker package and drawings of the basic techniques of pencak silat that will be used in learning activities. The media used must be declared valid by experts. Validity according to Nieven in Rochmad (2012) can be seen from the products produced by Augmented Reality (AR) media and related products consistently with one another (material). Based on the validation value of the expert team (2 media experts and 1 material expert) the media to be used is declared valid, in other words, it can be used with a slight revision. Then the device can be used for field testing and can then be further refined based on suggestions and input from all learning components.

4. Discussion

Regarding the validity of the learning media produced, according to students, they became more active in learning activities using Augmented Reality (AR) media. This is in accordance with the results of research proposed by Hamilton & Ole Newa (2010) Augmented reality creates an authentic learning environment suitable for various learning styles that have a positive influence. Augmented Reality technology used to develop this media is marker-based AR technology, meaning that to see virtual objects in the form of 3D movement models in this application there must be a marker image object that is scanned using a smartphone camera. The marker image is called the "target marker".

With existing marker-based Augmented Reality technology, the pointed object can only be loaded on the screen from one marker and another marker must be added to load on the screen the same object again. This situation creates a problem where the relevant markers should be extracted and printed so as to contain multiple activated objects (Jung et al., 2010:10).

The use of Augmented reality (AR) technology in the development of learning media provides a different experience, both for teachers and students. Augmented Reality facilitates learning and makes learning fun, and is able to form a conducive learning environment (Markamah et al., 2018) so that the response from the user or student becomes better and positive. (RM Garrido, 2015).

In a systematic review of research and applications, the use of Augmented Reality (AR) in education has been shown to be effective for several purposes, such as better learning performance, learning motivation, student engagement and positive attitudes (Bacca et al 2014:133).

According to Gutierrez et al (2016: 482) the limit of using Virtual Reality and Augmented Reality technology in the educational environment is not in the use of technology itself, but in terms of how students learn. Virtual learning experience is not only aimed at gaining knowledge, therefore it is necessary to design a learning environment from a constructivist approach to get the full benefits of learning. The results of Morales and Saunches (2018) research on the use of AR in education reveal that AR can increase motivation, learning outcomes and create positive perceptions of learning and facilitate learning to understand the material better.

AR provides an opportunity to put their knowledge and skills into practice, combining digital information with a real-world environment (Wojciechowski & Cellary, 2013) AR-supported learning applications have a positive impact on academics. For example, Chiang et al. (2014) stated in their study of AR that AR allows students to practice learning as it is in an entertaining setting. In another study, Hsiao et al. (2016) show that AR provides better understanding, memory, concentration, interaction, and more. attractive learning environment compared to traditional learning environment.

5. Conclusion and suggestions

Through the use of Augmented Reality technology, an Augmented Reality learning media application "Pencak silat" has been developed. The developed application received a very good response from students seen from the results of product trials. The results obtained based on the product trial questionnaire were included in the "very good" category. This shows that this media application can be well received by students and is suitable for use as a learning media to support the learning process, both in class and independent learning. The products developed are not only in the form of an application, but also a guide book for using the application and a textbook equipped with a marker. The application is easy to install on smartphones and easy to use by lecturers and students because it is accompanied by a practical guide book.

Augmented reality technology media is recommended for students and lecturers to be applied as a learning media that can be used anytime and anywhere so that it can achieve learning objectives effectively and efficiently.

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