AR MOOC's (Augmented Reality Massive Open Online Course) to Support the Implementation of Distance Learning

A M Nidhom¹, A B N R Putra² Azhar Ahmad S³
¹,³ Department of Electrical Engineering, Universitas Negeri Malang, 65145, Indonesia.
² Department of Mechanical Engineering, Universitas Negeri Malang, 65145, Indonesia.
nidhom.ft@um.ac.id

Abstract. This study aims to reveal (1). Development of Augmented Reality (ARMOOC's) coupled with MOOC's to improve distance learning; (2). Fraction of the concept of All Education Blended which shows learning constantly updated; (3). The results of this study are the MOOC's concept which is integrated with the actual Augmented Reality, MOOC's as a place for student access through an online system that can be accessed anywhere and anytime, while Augmented Reality as a supplement of content that supports student activities to find out about learning. The results of the development of AR MOOC's can be concluded as follows: (1) The development of AR MOOC's (Augmented Reality Massive Open Online Courses) has the value of efficiency and effectiveness at the usability test stage of 88.9% which shows that the level of user usability is very high in AR MOOC's ; (2). The application of AR MOOC's as a supporter of distance education is quite successful, this is evidenced by 81.2% of users giving very good responses to universal use and the remaining 8.8% stated that it was sufficient; (3). The results of quantitative data indicate the significance of an increase in interest and ease of learning> 0.05, so it can be proven that the development of AR MOOC's can be generalized to distance learning.

Keyword: MOOC's; Distance Education; Augmented Reality

1. Introduction
The development of learning innovations today is believed to have a wide scope, this is because there is always something new in learning. In this case interactive learning can create a good, conducive and comprehensive learning situation [1]. The development of learning innovation is believed to have several forms of approach, one of which is an interactive approach that has direct feedback advantages. Feedback is obtained through direct interaction with the user through the online learning system that we now know as Blended Learning and developed into MOOCs (Massive Open Course Online) which can now be coupled with AR (Augment Reality) in the application of the concept of AI Injected e-Learning (The Future of Online Education) [2]. The use of AR is not new in learning, according to [3] good learning, is learning that is able to integrate several aspects in a learning situation, this integration results in Fun Real Time learning collaboration. MOOcs is a breath of fresh air for PTJJ (Distance Open
Education) that is able to integrate the concept of education as a whole, anyone can access educational content and anytime, anywhere.

This concept supports national development through comprehensive education to remote areas of the country, through the process of improving the quality of education on a national scale. This is the distribution of education through the use of information technology in education such as the use of digital learning (Moocs, E-Learning, etc.) in the era of the industrial revolution 4.0 (Minister of Communication and Information: 2018). MOOCs as one of the largest providers of educational content in the world has comprehensive coverage, the idea of combining MOOCs with AR is to make it easier for users to learn, in 2018 recorded, almost 78.30% of Indonesian citizens have smartphones that can access the internet. This proves actually that online learning does not have significant problems when applied to all corners of the country, supported by AR functionality to provide educational content MOOCs that can be displayed in real time. The ease that is given to users to scan markers contained in MOOCs and display learning material in 3D makes learning more interesting and efficient.

2. AR MOOC’s Literature

The development of integrated AR MOOCs in addition to carrying the concept of learning for anyone and at any time, also provides creativity for educators to develop more detailed and informative learning packages both in synchronous learning and asynchronous learning. Preliminary studies reveal that the use of MOOC’s among students majoring in electrical engineering, informatics engineering education courses in computer graphics courses (Trial Material 1 and 2) has a large contribution as a supplement of learning that can be accessed in real time in the experimental class, the use of MOOC's has become one vehicle independent learning experimental class to develop the ability of understanding through ARMOOC's, this is in line with what delivered [5] through Augment Reality students are encouraged to be more active and creative.

In connection with the use of MOOC’s and AR in the world of education, [6] explained that the technological mechanism used in education has at least 3 characteristics, namely user friendly, usability and effectiveness. User friendly functioned to provide ease of use of the project for users, so users feel comfortable using the product, usability is more emphasized on the quality level of the system that is easy to learn, and encourages users to use the system as a positive tool in completing tasks. In this context, what is meant by the system is AR MOOC’s software or web pages that will be developed. Effectiveness refers to the effectiveness and how accurate the use of technology to support learning.

3. Methods

ARMOOCs learning innovation products developed have the following specifications: 1). E-Learning that carries the MOOC concept with AR marker learning content that can be accessed through the user's smartphone; 2). Products are online sources so they can be accessed anywhere and anytime; 3). The material contained in the MOOCs is entirely through the validation stage of the relevant material and at least has 1 expert in it (the person in charge of the material); 4). Access MOOCs have 2 types, student access and general access (differences in each access to the material provided) 5). ARMOOC’s has a marker that can be accessed using a smartphone.

ARMOOC's learning innovation products use development (Research and Development) with action research and experimental designs. Development activities are carried out by referring to and following the conclusions of the procedural steps recommended by several development research models that have been carried out by several experts including: Borg and Gall (1992); Gall, Gall, & Borg (2003); Richey & Klein (2007); Peffers (2007). In general, the summary of procedural steps to carry out the development is presented in Figure 2.1.
Research and development is carried out by following ten procedural steps, starting from collecting need assessment data to producing products that have been tested and disseminated to users (Borg and Gall, 1992). The ten steps that must be carried out include: (1) the research and information gathering stage; (2) the planning stage (planning); (3) the stage of building a product pre-plan (develop preliminary from of product); (4) preliminary field testing; (5) product revision stage (main product revision); (6) product trial phase in the field (main field testing); (7) operational product revision stage; (8) operational field testing phase (operational field testing); (9) the final product revision stage; and (10) dissemination and implementation stages.

The design of AR MOOCs activities refers to the systematics of the MOCC process that was first used, namely the use of the LMS (Learning Management System) library which is used as a learning resource center [7]. Teaching modules in the form of E-Modules, Videos or jobsheets in Computer Graphic course material or other courses (very possible) are illustrated as a container that holds spices into one, then the container is sorted according to function, some are in the form of finished spices or separate spices. When the user needs it will take one of these spices, this is the same as ARMOOC's concept which provides a choice of several courses that can be used by students or the general public who want to access lecture content by developing Augment Reality in it using Synchronus or Asynchronous methods. The complete MOOC flow chart can be seen in Figure 3.2.

In the product trial phase, the course used is Computer Graphics, this is based on the argumentation Computer Graphics is one of the courses that can be used by the general public to develop their skills in the field of informatics.
4. Result and discussion

The result of the development of this product is the development of MOOC which is integrated with Augment Reality in which there are learning content in the form of animations and videos that represent learning innovative learning to support the flexibility and accessibility of the use of instructional media. The results of product development also go through a series of product tests and revisions that aim to see how effective the use of products in learning.

a. First Test Results

In the first test results of the development of AR MOOC’s, product development was carried out through a series of detailed structural mechanisms, one of which was the development of each learning chapter summarized in table 4.1.

Tabel 4.1. Details of sub-chapter Computer Graphics courses

| No | Modul Name | Sub Discussion |
|----|------------|----------------|
| 1  | Modul 1    | Open Gl        |
| 2  | Modul 2    | Primitive Object |
| 3  | Modul 3    | Transformasi Object |
| 4  | Modul 4    | Animation Object |
| 5  | Modul 5    | Interaksi Keyboard |
| 6  | Modul 6    | Interaksi Mouse |
| 7  | Modul 7    | Object 3 D     |
| 8  | Modul 8    | Lighting       |
| 9  | Modul 9    | Mapping        |
| 10 | Modul 10   | Texturing      |
| 11 | Modul 11   | Embedded Object 3 D |

In table 4.1, it is explained about the distribution of sub-chapters of Computer Graphic courses developed on products, this refers to the Information Technology Education curriculum which has the wishes of sub-chapters in 9 modules. After compiling the details of the sub-chapter, then the development of MOOC with the hashtag #kuliah free online on social media, MOOC access can be accessed through the page http://mooc.um.ac.id to support distance learning (PTJJ) which is under the auspices of the State University Unfortunate, in the first test the AR application was developed along with supporting markers in MOOC through markers that were tested using the concept of fusion technology [8] by combining several technologies into one through white box testing and direct testing through users.

The use of the AR Marker has several special requirements, one of which is the use of a License Key is a few lines of code used to verify an AR application that is made unique and is only used on one object (Single object or 3 Dimensions). With this License Key, Vuforia is able to detect the use of markers in each application that is used, following the form AR MOOCS marker.
b. Product Revision
At the product revision stage the development began to tidy up the use of AR markers and the efficiency of the use of markers to make it faster so that some markers were replaced to become coloring markers to be able to display results more clearly and focus on one form of 3D and video objects.

c. Hasil Pengujian Kedua
In the second test, AR MOCC's products were seen through distance testing and tracking methods to determine the project readability level through a series of test processes from a distance of 3 cm to 300 cm to determine the average minimum distance and maximum distance of the marker read properly. In testing the distance of the use of markers, the closer the marker distance to the camera will result in the size of the marker which is detected is greater, so that it can be caught properly [9]. However, when the distance between the camera and the marker is getting farther away, the size of the marker captured by the camera is getting smaller, so the marker pattern becomes unclear and causes the marker to not be detected. One problem with the distance between the camera and marker is the degree of focus of the image captured by the camera. Quality cameras that have an autofocus feature so marker detection will work well. Here are the results of marker testing, as shown in table 4.4 testing the distance between the camera and marker.
Tabel 4.4. Marker Distance Testing Table

| Metode Tracking    | Pengujian Jarak (cm) | Ket. Jarak |
|-------------------|----------------------|------------|
|                   | 3 5 10 20 30 40 50 80 300 | J. Min J. Max |
| **Marker Based Tracking** | T T Y Y Y Y Y T | 7 cm 84 cm |
| **Markerless**     | Y Y Y Y Y Y Y Y    | 3 cm 300 cm |

AR MOOCS system testing is also done to find errors or deficiencies in the software being tested. Testing intends to find out the software that is made already meets the criteria in accordance with the design objectives of the software. In this study, the testing conducted on the system is functional (alpha) and beta testing. The method used in this test is blackbox testing which focuses on the functional requirements of the system being built [10]. The menu display test is a functionality test to display the menus that have been applied in the application, as shown in table 4.5.

Tabel 4.5 Example instrument testing menu display

| No | Case/Test   | Scenario test result | Expected test result                                                                 | Final test result |
|----|-------------|-----------------------|--------------------------------------------------------------------------------------|-------------------|
| 1  | Choose Button | Display information about the application | [✓] success                                                                           |                  |
| 2  | How to use button | When the user presses button how to use, it will display information on how to use the application. | [✓] success | [ ] not success |
| 3  | Choose button Star AR | Displays the application AR, if the user points the marker at the camera it will display the 3D object of the custom house. | [✓] success | [ ] not success |

Light testing is also needed to see the effect on the detection of markers, the lighting conditions around the camera against the marker by the lamp are different from the lighting conditions around the camera against the marker by sunlight, then it can be determined by the thresholding settings used so that the camera can detect the marker properly. The following are the results of the marker test, as shown in table 4.6 of the ambient light camera test.
Tabel 4.6 Light Testing Results

| The type of light around the camera | Value Settings Thresholding | Light Testing Results                  |
|-----------------------------------|----------------------------|----------------------------------------|
| Lamp light                        | 120                        | The marker is detected well            |
|                                   | 80                         | The marker is detected well            |
|                                   | 50                         | The marker is detected well            |
| Light of the Sun.                 | 120                        | Markers detected, 3D models inconsistent |
|                                   | 80                         | Markers detected, 3D models inconsistent |
|                                   | 50                         | Markers detected, 3D models inconsistent |
| Dim Light                         | 120                        | Markers detected, 3D models inconsistent |
|                                   | 80                         | Markers detected, 3D models inconsistent |
|                                   | 50                         | Markers detected, 3D models inconsistent |

5. Conclusions

AR MOOC’s development is the development of IT MOOC’s fusion as distance learning and the flexibility of augmented reality as an object, combining these 2 forms of interactive multimedia not only facilitates the use of computers in learning, it also cuts the miss conception of distance learning which has been considered less active and cannot be monitored because it seems virtual. AR MOOC’s concept itself is a unique concept in learning where students are free to hone skills through discovery procedures to find appropriate learning. With this AR students are expected to develop scientific transfers evenly and flexibly. The development of AR MOOC’s (Augmented Reality Massive Open Online Courses) has the value of efficiency and effectiveness at the usability test stage of 88.9% which shows that the level of user usability is very high in AR MOOC’s; (2). The application of AR MOOC’s as a supporter of distance education is quite successful, this is evidenced by 81.2% of users giving very good responses to universal use and the remaining 8.8% stated that it was sufficient; (3). The results of quantitative data indicate the significance of an increase in interest and ease of learning > 0.05, so it can be proven that the development of AR MOOC’s can be generalized to distance learning.

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