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Implementasi Augmented Reality (AR) Sebagai Media Pembelajaran Matematika Transformasi Geometri

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ABSTRACT

This research aims to develop Augmented Reality-based mathematics learning media on Geometry Transformation material for Class This research is development research or Research and Development adapted from the ADDIE development model. Validation was carried out by media experts and material experts from Bhinneka PGRI University lecturers and SMKN 2 Boyolangu teachers. The media developed was tested on 34 students of class XI Banking 2 SMKN 2 Boyolangu. The results of the research show that the level of feasibility of Augmented Reality-based mathematics learning media on Geometry Transformation material is based on the assessment: 1) Media experts obtained a total score of 57 and if the percentage was obtained a score of 71.25%, so it is included in the "Decent" category, 2) Material experts obtained a total a score of 50 and the percentage gets a score of 62.5%, so it falls into the "Decent" category, and 3) The second material expert gives a score of 73 if the percentage gets a score of 73.75%, so it falls into the "Decent" category. The entire student questionnaire received a response percentage of 85.46% in the "Very Eligible" category. And from an individual perspective, student responses have a percentage of ÿ71.15% in the "Decent" category.

Keyword : Development; Learning media; Augmented Reality; Geometric transformation

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1.   INTRODUCTION

Education is one of the factors in creating quality human resources (HR). For a nation, education is a field that wants to continue to be developed in order to create a developed nation. So it is not surprising that education is a priority for a country's government. Education in Indonesia has been prioritized even since the era of the independence movement. So education must now be implemented as well as possible in order to realize educational goals.

The main problem students have is understanding concepts. The cause is a lack of understanding of the prerequisite material for the material provided, so that in learning teachers still have to often guide students (Amaliyah, 2017). States that every mathematical concept or principle can be understood perfectly only if it is first presented to students in concrete form (Suharso, 2012).

For teachers, mastering knowledge about technology in education makes teachers able to adapt to current developments. One way to develop this competency is by mastering and utilizing technology (Listiawan, 2017).

Technological developments are increasing rapidly, sophisticated technologies are being created according to human needs in this increasingly modern era (Rusnandi, Sujadi, & Fauzyah, 2015). The development of education and the use of technology in the world of education is increasingly developing, thus requiring reforms to keep pace with these developments (Budiman, 2017). The development of technology and information has spurred the creation of information technology-based learning media (Putri, Karmila, Candiasa, & Suweken, 2016).

Augmented reality (AR) is the understanding and exploitation of the properties of material objects; while in recreational applications, the goal is to produce fake objects for our aesthetic pleasure and to stimulate our imagination (Ariso, 2017). With the technology available on smartphones, it can also be used as a learning medium, so that it can be used anywhere and anytime, the development of smartphone hardware specifications at this time has been sufficient in developing software that

previously could be run on PC devices and can be run on smartphone devices (Adami & Budihartanti, 2016).

Thus, learning media emphasizes the position of the media as a vehicle for transmitting learning messages or information to condition someone to learn (Riana, 2008). Learning media is really needed by teachers to help convey material in a learning process (Hakim, 2018).

Geometric Transformation is a change in the position of a point in Cartesian coordinates according to certain rules. In geometric transformations, it is known that there are 4 types of transformations that can be carried out on a Cartesian coordinate, namely translation, reflection, rotation and dilation (Zuliana, 2015).

Based on the background above, the aim of this research is to produce learning media and to determine the feasibility of augmented reality-based mathematics learning media on geometric transformation material for class XI high school/vocational school students.

2. RESEARCH METHOD/MATERIAL AND METHOD/LETERATURE REVIEW

This type of research is research and development. The development model used is the ADDIE model, namely the Analysis, Design, Development, Implementation and Evaluation stages.

The Analysis Phase consists of: (a) Needs Analysis, (b) Technology analysis, (c) Curriculum Analysis. The Design Stage includes: (a) Flowchart and Storyboard, (b) 3D View Creation. The Development Stage consists of: (a) Creating Media Learning takes the form of Application, (b) Validation and (c) Revision. At the Implementation stage, the media is tested on the subject and at the Evaluation Stage.

The instruments used in this research were expert validation sheets and student response questionnaires.

Table 1. Assessment Instrument Grid for Material Experts

No	Aspect	Indicator	No. Question
1	Learning	KD Suitability	1,2,3
		Clarity of Material	4,5,6
		Material Determanition	7
		Material Variations	8
		Material Attractiveness	9
2	Fill	Question Difficulty Level	10
		Material Description	11,12,13
		Material Organization	14
		Giving Examples	15,16
		Language	17,18
		Clarity Of Information	19,20

Eligibility Percentage (%) = (Score obtained)/(Maximum Score)×100%

Searching for percentages is intended to find out the status of something that is presented as a percentage and is still presented in the form of a percentage, but percentages can also be interpreted using qualitative sentences, for example very decent (76% - 100%), decent (56% - 75%), quite decent (40% - 55%), not feasible (0 – 39%).

3. RESULTS AND DISCUSSION

A. Analysis Stage (Analysis)
Needs Analysis
The development of smartphone-oriented learning media could perhaps be more utilized, because students spend much longer with smartphones than with teachers. Based on the tendency of students to depend on their respective smartphones, this can be used to create learning media that is close to students. Based on the researcher's observations, all students in class XI use smartphones with the Android operating system.

B. Technology Analysis

The hardware used by researchers to create this learning media is:
1) Intel Celeron
2) 2GB RAM
3) 50 GB hard disk

The software used to create this learning media is:
1) Unity 5.6.7
2) Corel Draw X3
3) Android SDK
4) Android NDK r21
5) Java Development Kit

C. Curriculum Analysis

Curriculum analysis was carried out to examine the curriculum and material for class This process begins by selecting Geometry Transformation material that is in accordance with the school curriculum, namely the 2013 curriculum (K13).

D. Design Stage

Making Flowcharts and Storyboards

Flowcharts function to explain the flow or process of media work. With a flowchart, the sequence of activity processes in learning media becomes clearer.

Storyboard is a visual depiction of the appearance of learning media in the form of sketches. Storyboards function as a guide for developers to facilitate the media creation process.

3D View Creation

The 3D view of each transformation operation was created using the Unity application.
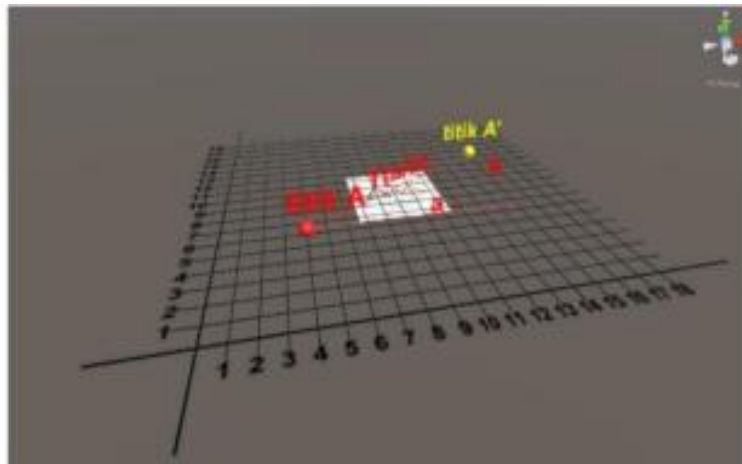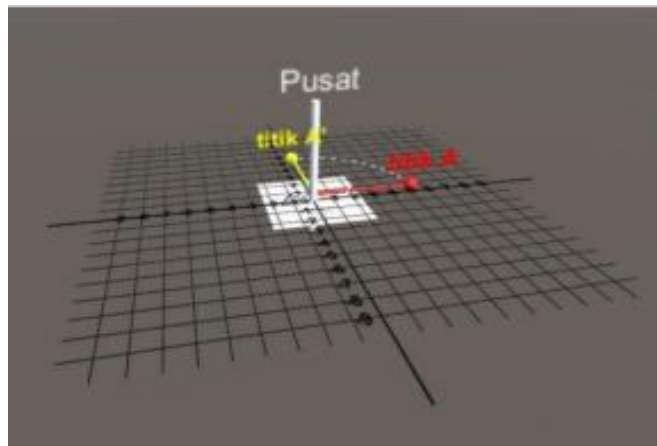

Fig 1. 3D Translation View
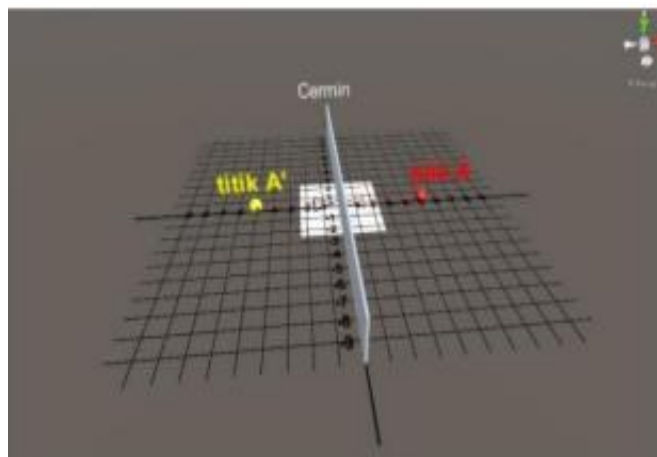
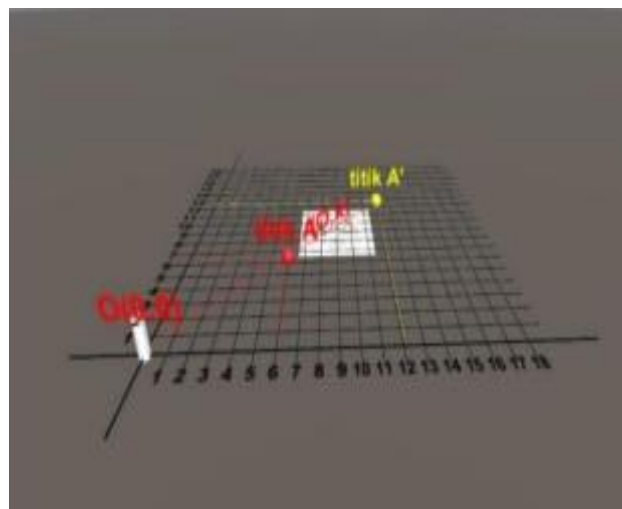Fig 2. 3D Rotation View

Fig 3. 3D Reflection View

Fig 4. 3D Dilated View

E. Development Stage (Development)
Product Manufacturing

All components of the storyboard and flowchart are implemented in Unity as the main media creation application and Coreldraw as the graphics creation application from components in the media. The first step is to create an application logo "Augmented Reality Geometry Transformation" then create an Opening Page containing a welcome greeting and introduction to the Application. After pressing the NEXT button, the user will be directed to the application instructions page.

Please read the instructions for use first before entering the menu page main. To go to the main menu page, users must press the main menu button.

Fig 5. Main Menu Page Display

On the Main menu page there are several sub menus, namely:
1) Translation, this menu will direct you directly to the Augmented Reality Translation page.
2) Rotation, this menu will direct you directly to the Augmented Reality Rotation page.
3) Reflection, this menu will direct you directly to the Augmented Reality Reflection page.
4) Dilation, this menu will direct you directly to the Augmented Reality Dilation page.
5) KI & KD, this menu will direct you directly to the KI & KD page.
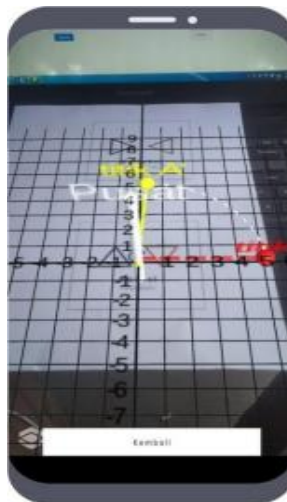6) Instructions for Use, this menu will direct you directly to the Instructions page use.

Fig 6. Augmented Reality Display of Rotation Page

On the main menu page, apart from the 6 menus, there are also buttons to close or exit the application. The media is then validated by the validator. At this stage the media is validated by 1 material expert lecturer, 1 mathematics teacher as a material expert and 1 media expert lecturer.

The development of learning media using AR technology can be created in an Android smartphone application package. Geometric transformations can be presented in animated 3D shapes in AR which can help students understand the concept. The product developed is designed so that students can deepen their understanding of Geometry Transformation material. This research also agrees with (Hakim, 2018) who stated that through Augmented reality, teachers can create learning media that are fun, interactive, and easy to use. Augmented reality can also replace learning modules that do not yet exist in schools in virtual or virtual form. Proven by the results of trials on material experts, media experts and also students who produced scores in the appropriate category.

4. CONCLUSION

Based on the results of the study and data analysis, it can be concluded that Mathematics Learning Media Based on Augmented Reality (AR) can be created well. The feasibility of the Geometry Transformation Augmented Reality application based on the media expert's assessment of all aspects received a score of 71.25%. Furthermore, the feasibility of the Augmented Reality Geometry Transformation application based on material expert assessment 1, all aspects received a score of 62.50%. Then the feasibility of the Geometry Transformation Augmented Reality application based on material expert assessment 2 overall aspects received a score of 73.75%. From the trial conducted at SMK Negeri 2 Boyolangu by 34 students, the response was good because all students' total points showed a percentage of ÿ71.15%. From the results of the validator assessment with the feasibility category being in the feasible category, as well as the percentage of student responses that showed good responses, it can be concluded that this Android application is suitable for use as a mathematics learning medium.

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