Analysis development of augmented reality in android-based computer learning in vocational schools

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Abstract. The making of this paper aims to analyze the latest technology used in Augmented Reality in vocational education. Augmented Reality is a merger between the virtual world and the real world which is projected in 2D or 3D form that is used for Entertainment, Engineering Design or as a learning medium. Augmented Reality is expected to be able to attract students' interest compared to conventional learning methods. The method of making paper uses a literature review that is with 30 papers related to Augmented Reality starting in 2014-2019. Augmented Reality is built with a Blender 2.80 application, software Vuforia SDK, Corel Draw X9, Android Studio, and Unity 3D. Most of the research or development of Augmented Reality in 2014-2019 uses Blender 2.80, Vuforia and Unity 3D applications.

1. Introduction
A good learning process must contain aspects of interactive, fun, challenging, motivating and provide more space for students to be able to develop creativity and independence, according to students' talents and interests [1]. One of the ideas to optimize the learning process is the application of Augmented Reality technology, which is technology that combines virtual world objects with real-world real-time [2]. Augmented reality (AR) technology might facilitate the concept of scientific understanding because it increases the user's sensory perception of the real world by adding computer-generated content to the user's environment and offers interactivity between the real and virtual worlds. Indeed, the results of several studies suggest that AR might be useful in providing solutions to 3D visualization problems [3].

The latest research states that making learning methods that implement IT technology becomes the choice so that the learning process is more interesting by combining Android-based augmented reality technology with educational books [4]. Likewise, research conducted to see an increase in student learning outcomes following the learning of Information and Communication Technology (ICT) with cooperative learning type make a match (CLTMM) compared to ordinary learning. The research method used was a quasi-experimental research sample of which was a grade VII student of SMP Negeri 15 Bandung with a pretest-posttest control group design [2].

Seeing these conditions, the purpose of this study is the need for the development of learning systems by designing an Android-based learning media through the title "development of learning media using Augmented Reality technology in Computer and Android-based Basic Networks in Vocational High Schools".

The emergence of smartphone devices, especially since 2010, has led to the acceleration of the growth of Augmented Reality applications in many fields such as tourism, medicine, industry, and...
education [5,6]. Augmented Reality (AR) technology might facilitate the concept of scientific understanding because it increases the user's sensory perception of the real world by adding computer-generated content to the user's environment. Indeed, the results of several studies suggest that AR might be useful in providing solutions to 3D visualization problems [3].

2. Method
The methodology used in this study consists of 4 stages in the process. The first starts with the PRISMA (Selected Reporting Item for Systematic Review and Meta-Analysis) method, which was introduced by Moher et al. [7]. PRISMA is one of the best methods that can help the writer to carry out systematic reviews and meta-analyzes correctly and also helps the writer to review structures such as a road map. PRISMA is also the most commonly used method in articles such as literature reviews, such as Moher et al. [7-9].

In addition, this review must also determine criteria that meet the requirements so that they can be chosen carefully to describe the hypothesis [10]. This can be an important role in solving problems by explaining, synthesizing, and evaluating quantitative or qualitative evidence as reported [11]. The second system design is to apply all the theories of support and components that have been collected in building an Android-based Augmented Reality application. The third is testing and analysis, which is to test the system after the application is finished making which will produce some data. After that, the analysis process will be carried out to find out the successes and mistakes in the application implementation that has been made [6].

At this stage, selected scientific articles related to Augmented Reality published in journals indexed in the Scientdirect (51,373) and Google Scholar (908,000) databases. A literature search is performed using keywords including "augmented reality", "augmented reality based learning modules". These journals were searched from 2014 to 2019. Based on the search strategy, 30 articles were taken and entered into citation management software such as Mendeley. By doing the PRISMA method, the next step is the automatic removal of duplication by the software. Deletion of duplicates is done, where the same 10 articles have been deleted. Finally, 20 articles remain after the stage.

| INCLUSION CRITERIA | EXCLUSION CRITERIA |
|--------------------|--------------------|
| Span of a year : 2014-2019 | Before 2014 |
| Empirical research published through international conferences related to Augmented Reality | Types of book chapters, theses, brief reports, studies or non-empirical articles |
| All disciplines related to Augmented Reality |

Eligibility criteria are needed in selecting the appropriate article as reported by Redondo et al. [11]. The articles were filtered based on the inclusion and exclusion criteria described in Table 1. According to the exclusion criteria, articles that met the requirements were selected, but for the type of chapter book, thesis, brief report, study or non-empirical article, it was deleted. In other words, only journal papers are considered according to inclusion criteria. In this case, 17 unsuitable articles were deleted and 12 became articles. Article filtering is done by investigating the title and abstract based on the relevance of the subject of the article related to augmented reality as a medium of learning in SMK. During this stage, irrelevant articles have been deleted. In total, 12 articles fit the inclusion criteria and are relevant to the objectives of this literature review study.

3. Results and discussion
Findings from the results of the analysis and synthesis of related articles are presented in this section. Based on systematic reviews and the results of meta-analysis data, augmented reality is found. Therefore, studies that meet the requirements regarding augmented reality are summarized and classified as follows. This is based on the various categories considered about the research objectives. The articles reviewed in this literature review are 12 articles that meet the inclusion criteria.
Articles taken through a database search based on keywords and the year the article was published in the first step. The frequency of articles published in the period between 2014 saw a significant increase in articles published from 2016 to 2019. This is evidenced by the small amount of research that has been done. Therefore, based on these results it is clear that increased interest in implementing augmented reality media as an android-based learning media in its application in SMK.

In the distribution of articles based on this aspect, found several types of applications used in the development of android-based augmented reality learning media such as:

3.1. Blender 2.80
Blender is a 3D creation suite that offers the entirety of the 3D pipeline including modeling, rigging, animation, simulation, rendering, compositing, and motion tracking. It allows video editing as well as game creation.

3.2. Vuforia SDK
Vuforia is an augmented reality software development kit (SDK) for mobile devices that enables the creation of augmented reality applications. It uses computer vision technology to recognize and track planar images and 3D objects in real time.

3.3. Unity 3D
Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.’s Worldwide Developers Conference as a Mac OS X-exclusive game engine. As of 2018, the engine had been extended to support more than 25 platforms.

3.4. Corel Draw X9
CorelDraw (styled CorelDRAW) is a vector graphics editor developed and marketed by Corel Corporation. It is also the name of the Corel graphics suite, which includes the bitmap-image editor Corel Photo-Paint as well as other graphics-related programs (see below). The latest version is marketed as CorelDraw Graphics Suite 2019 (equivalent to version 21), and was released in 12 March, 2019. CorelDraw is designed to edit two-dimensional images such as logos and posters.

3.5. Android Studio
Android Studio is the official integrated development environment (IDE) for Android application development. It is based on the IntelliJ IDEA, a Java integrated development environment for software, and incorporates its code editing and developer tools.

In the final step, 12 full text articles that will contribute to this review literature are examined. The article is examined carefully to extract and summarize the important information needed to answer the research objectives in this literature review. Based on the information needed, several classifications and criteria that are relevant to the objectives are considered.

Data extraction is designed to classify, analyze, and synthesize articles that meet the requirements based on specified criteria. Then, based on data extraction analysis, we can achieve the best results and recommendations. Criteria are the author, year of publication, type of article, journal or conference, sample size, context, type of data and basic findings. After reviewing and summarizing the articles collected, 12 articles from 8 international scientific journals and 2 conferences from 2014 to 2019 were matched with inclusion criteria that were recognized as suitable articles for analysis and interpretation in this review literature. All texts are read, and details are for selecting articles related to augmented reality. However, it is still carried out by the PRISMA method although choosing the right article requires a lot of time but due to the special structured nature of this method, it is certain that the most appropriate and relevant articles related to this subject are reviewed literature review.
4. Conclusion
From the description above, several conclusions can be drawn. Learning media become inseparable things in learning. This is because the success of the material delivered by the teacher is also influenced by the learning media used. In this modern era, learning media is certainly very easy to find. Besides being easy to get, the need for carefulness in choosing the media used. The media must be able to reach all students and be an alternative solution lack of practicum modules in SMK. Through Augmented Reality, teachers can create learning media that are fun, interactive, and easy to use. Augmented Reality can also be replacing learning modules that do not yet exist in school in virtual or virtual form. Students can still see and use modules like the original, but deep modules virtual form. Through this new breakthrough, more and more variations of learning media can be built to support learning activities in schools, especially SMK that require practicum learning modules.

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