

# The Potential of Augmented Reality for Vocational High School Learning Amid Covid-19 Spread

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## ABSTRACT

Due to Covid-19 spread, the learning system in Indonesia changes from classroom learning to distance learning which has impact on practical learning. Practical training in vocational high school is primary important to prepare students in industrial environment. A technology is needed to combine reality and virtual into 3-dimensional form and projected in real time as known as augmented reality. Augmented reality can extend the integration of digital learning and real world. The purpose of this research to determine the possible augmented reality for vocational high school learning amid pandemic. This research used a systematic literature consisting of planning, selection, extraction and execution. This research used related previous research through the potential of augmented reality in the learning process sourced from article conference and journal since 2013-2020. The result shows that augmented reality is used as an alternative media in education learning process at all level. Augmented reality has various potentials issues used as an interactive media to manipulate the practical learning object, increase motivation, increase learning outcomes and reduce cost for long term.

**Keywords:** *augmented reality, potential, Covid-19, vocational high school*

## 1. INTRODUCTION

Since declaring Covid-19 emergency in March 2020, Indonesian government has begun to take various actions through distance learning policy to anticipate Covid-19 transmission. Barriers in conducting distance learning in Indonesia are the changes in learning dynamics, including classroom learning is transferred into distance learning, transformed learning media is based on technology, learning methods used are still in the adjustment stage, adjusting process of graduation standards and grade promotion and the parents' role in controlling the children learning process at home [1], students have low learning independence [2] and resulted in students' low motivation and learning outcomes [3]. Students consider that distance learning is not interesting as classroom learning [4].

Distance learning occurs from elementary to higher education, including vocational high school. Vocational high school prepares the students and graduates to face the industrial world and have competence in vocational field [5], [6]. Vocational high school graduates have to master high competency skills evidenced by a competency certificate as a condition for entering global competition to make them able to work according to their fields [7]. Students from vocational high school are required to master skills in accordance with their fields to carry out learning practices to suit industry needs. Inadequate facilities and infrastructure

are serious problem for vocational high school [8], especially during Covid-19 spread, when students just meet through distance learning without carrying out practical learning in school. In addition to implementing practice, a step used to align skills in school with the needs of industrial world is done through work practices [9]. However, due to this pandemic, work practices at industrial world are stopped while learning are conducted through online system.

Technology in the form of mobile-based learning media is a way to deal with distance learning barrier [10]. The use of technology in distance learning can be conducted by using mobile-based learning media through e-books, games and simulations [8]. Mobile-based learning through simulation aims to provide a more concrete learning experience through imitation design that are closer to a real condition [8]. Augmented Reality (AR) is a technology that can be used to implement the simulation learning as a learning media that can facilitate students' understanding during learning because it can visualize material and contain cognitive content; it can be used as learning media for teachers as well [11]. The development of AR technology in learning is supported by Internet users in Indonesia increase amounted 17%, where 64% of population uses the Internet access in 2020 and 94% among Internet users use smartphone as the operating device [12]. The aim of this research is to determine the potential of AR in vocational learning amid pandemic. This research synthesizes a literature review

of AR potential in learning activities, especially distance learning for vocational high school students.

## **2. LITERATURE OF RELATED REVIEW**

### **2.1. Distance Learning**

Distance learning is a learning process conducted between teachers and students without contacting face to face and carrying out in different places [13]. Provisions for distance learning are regulated in the Circular Letter of the Minister of Education and Culture Number 4 Year 2020. The differences between distance learning and classroom learning are the interaction occurred between teachers and students, the role of human resources, the technology used, program types, implementation management and etc (Ahmad, 2020).

### **2.2. Augmented Reality**

AR combines two situation between real and virtual world [14] and changes the way humans interact with the physical environment. The technology of AR drives the users to interact between the physical objects and the virtual objects by using the mobile phone camera or tablet [15]. The rapid development of mobile phone media has made AR technology widely adopted by humans to improve the way humans see and feel in various ways in everyday life [16]. AR technology has been widely adopted in various fields including tourism, marketing and learning environment [16]. One of the most common use of AR is Instagram application in the form of Instagram filter. Augmented Reality has some features such as immersion, navigation and interaction [17]. The first feature is immersion consisting of aspects of the physical environment and the condition in which the users enter AR activities [18]. Interaction in AR results in changes in the physical appearance of technology and will change users' immersion [19]. The second feature is navigation where digital information is developed in the real environment as users' perspective [19]. Navigation changes the users' perspective on how objects are placed. Navigation aims to direct users' interaction with the technology used [20]. The third feature is interaction in real time, where the interaction can increase users' understanding, memory and imagination of objects [19]. These three features are expected able to increase users' satisfaction, help to understand comprehension and be useful for learning tasks requiring experiment.

## **3. METHOD**

This was a systematic review research. The systematic review used a stage model developed by Chitu Okoli [21] consisting of planning, selection, extraction and execution. This article used keywords AR in

vocational high school, implementation AR through mobile phones and literature review of the benefits of AR for education in its search. In this research, there were 88 articles identified and produced 25 relevant articles from journals and conferences articles during 2013-2020.

## **4. RESULT AND DISCUSSION**

### **4.1. Augmented Reality on Education**

AR has been widely adopted in education and used as an interactive learning media. The use of AR in learning is based on Theory of Interactive Media Effect. Theory of Interactive Media Effects (TIME) states that media is related to human psychology, the media used, how to communicate to others, where the media will provide immersive experiences for users and influence the affective, cognitive and behavioral aspects [22]. Immersive experience will be received when the users interact with the application and give their consent to the activity (dragging, clicking, scrolling, etc) [23]. TIME proposed by Sundar [22] explains that the success rate of media use depends on the type of media used in an interaction. In interactive learning media, the communicant is no longer as a message passive recipient but actively involved in learning media through various interaction activities and message construction [22]. Interactive learning media for learning process is AR [24] - [27].

### **4.2. The possible Augmented Reality in vocational education**

Pandemic gives various challenges in the educational world, especially for vocational students. Amid the limitations, the vocational students who graduate during distance learning still have competency demands in accordance with the needs of industrial world. Distance learning with AR simulation for the implementation of practical learning can be used as an alternative solution. AR learning combines the virtual and real world at the same time and is very useful for designing simulated learning [28]. Simulation learning using AR functions as a substitute for laboratory practices and industrial word practices [29] which is crucial during this pandemic, especially for vocational students. AR is able to describe 3D models, manipulate virtual objects and provide experiences based on abstract concepts [30]. Compared to practical learning videos, learning using AR is interactive, so there is two-way learning between students and learning media [25], [30]. Students can carry out AR learning independently and flexibly [31]. Previous research has succeeded in developing and making learning media with augmented effectively and validly for use in vocational high school learning [27], [32] - [38]

#### 4.2.1. Improving students' understanding

AR is able to improve students' understanding of the material [39], [40]. Therefore, the utilize of AR in the learning process can lead the improvement of students' learning outcomes [28], [40]. AR provides understanding to students to improve higher thinking skill, creativity and critical analysis [25], [41].

#### 4.2.2. Having a longer memory level

The use of AR is able to improve users' memory with interesting experiences gained during media used [42].

#### 4.2.3. Increasing students' motivation

AR technology in the learning environment has a positive impact on students' motivation [19], [30], [39], [43]. AR is an interactive learning media that can increase students' interest, concentration and satisfaction with the use of new technology in learning [42]. The use of AR provides exciting new experiences for students.

#### 4.2.4. No need requiring any advanced devices to operate

Most of AR technologies can be run by mobile phone [44] and students can download the available applications for free. Mobile phone is a technology tending to be cheap and is mostly owned by society. Mobile phone is a flexible device which can be used anywhere, easy to carry and anytime.

#### 4.2.5. Reducing costs

The use of AR in learning reduces direct and material costs as well as laboratory maintenance costs [42]. Although the cost of developing AR tends to be expensive, its long-term utilization is cheaper than traditional learning [42]. Costs in AR application can also be reduced by changing book markers into cards, thereby reducing printing costs and making them more flexible to be carried anywhere [45].

## 5. CONCLUSION

AR is an alternative technology that can be used to simulate practical learning for vocational high school students by visualizing objects in 3D and still involving two-way interaction between students and learning media. Students are able to visualize practical learning in the classroom through an interactive AR technology by using mobile phone during distance learning amid the pandemic. Besides, potential in AR-based learning at vocational high school is able to improve students' understanding, have longer memory, increase motivation, do not require sophisticated equipment to operate and reduce learning costs.

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