Survey of use mobile augmented reality for teaching materials

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Abstract. This study discusses the review of the literature focuses on the use of Augmented Reality (AR) as a teaching material. Authors conducted a review 20 articles which were published from 2008 to 2018. Design studies also found a variety of experiments such as data, analysis, action research, surveys, mixed methods, and Research and Development. This review found that the use of AR as a teaching material in learning shows that the AR is able to improve your skills, understanding, motivation, response, and the results of student learning of the content and media used.

1. Introduction
One of the exciting new technology educators a few years back is the Augmented Reality (AR) [1,2], This technology integrates world where the real and virtual images [3], Gradually various fields has implemented the Augmented Reality (AR) since 1990 [4], Given the fact the increasing growth of technology in society [5], Mobile based learning increasingly needed to support educational institutions in improving learning strategies [6].

The use of augmented reality technology, combined with educational content in an effort to improve the effectiveness and appeal of learning for students in learning life [7], With the potential use of Augmented Reality in education very much that has not been discussed [8], These last few years, augmented reality become an important topic in the study, it can be seen from the many studies on augmented reality in each year [9].

Currently, the augmented reality technology has been used in a variety of disciplines and the training situation [10,11], Augmented reality showed that it has a positive impact on teaching and continuous learning in terms of learning outcomes [12], Augmented Reality also provides an abstract subject into an environment that will affect learning [13].

This article discusses the use of mobile augmented reality as teaching materials, this study aims to determine the impact and response to the use of mobile augmented reality as teaching materials. Educators and researchers can use this information to identify issues or questions unanswered in the literature and identify potential future research directions regarding the use of augmented reality as teaching material.

2. Theoretical framework

2.1. Augmented reality
Augmented Reality (AR) is a technology that integrates real world with the virtual image [3], This technology combines digital content with the real world [14], Augmented Reality has two methods for visualization, with use marker and without markers [14,15], Marker is a symbol of computer graphics...
created and printed as a liaison between 3D objects with a smartphone [16], The AR system will search for a predetermined pattern in the identification and then visualize. While the AR without markers using code to put digital data into an image that has been provided [5].

| Table 1. Advantages and limitations AR. |
|----------------------------------------|
| Exellence                              | limitation                         |
| - Interaction feels real.              | - Users do not see the real objects.|
| - Applicability cheaper.               | - Overall design environment        |
| - AR does not require special tools.   | cannot be applied by using AR.      |
| - The possibility of error is small.   |                                      |
| - Can be implemented in a broad range of media e.g. smartphones. | |

Much of the literature on the application of AR in the context of education for a wide range of disciplines. However, the current AR in education is still in the developmental stage [17,18], AR research in the field of education are being implemented with AR potential is so great for learning. AR application can be used in various computing devices and mobile devices that can increase motivation and interest in learning implementation [4,7,19,20], For example, Augmented Reality in use in education, an AR app for learning the electromagnetic concept. Where in the application students can explore the effects of magnetic fields [12].

3. Method

In a study of the literature on the use of augmented reality as these materials. The range of journals that began in 2008 to 2018 to be identified in the electronic database that was published in the leading journal in the field [21], while the electronic database that is used as Science Direct, the IEEE (Institute of Electrical and Electronics Engineers) and Google Scholar. In search accessible via a search using words such as Augmented Reality, Augmented Reality for Learning, Mobile Augmented Reality.

Stages in conducting a literature study are adapted from a systematic approach to the review of the literature. Choosing appropriate topic issues and interests, namely by collecting journals regarding the use of Augmented Reality is taken from an electronic database, then issue written completely and precisely, choose literature relevant to the research and choose the right data sources as needed research.

| Table 2. Literature review. |
|-----------------------------|
| STUDIES                     | FINDINGS                                                      |
| A Pilot Study on The Use of Mobile Augmented Reality Interactive for Experimentation in Quadratic Equations Ivan et al. [22] | - There is an increase learning outcomes for the experimental group, the average value is higher than the control group - From the interviews we can conclude a positive response from the students on the use of technology to support the learning process will come in future |
| Designing Mobile Augmented Reality Learning Exergames Laine and Suk [23] | - Development of Augmented Reality applications on mobile phones each respondent received a positive response, especially the utilization of the learning process. |
| Learning with mobile technologies - student behavior Laura Briz-ponce et al. [5] | - Medical students who varied in this study see the learning using mobile devices and applications is quite positive. - In short for the understanding and motivation can be created with the new technology in learning. |
| The effectiveness of virtual and augmented reality in health sciences and medical anatomy Moro et al. [24] | - VR and AR is an effective teaching tool - VR and AR provides additional intrinsic benefits, such as increasing student involvement, interactive and fun. |
4. Results and discussion

4.1. The impact of the use of mobile augmented reality
Results of the study were discussed regarding the use of Mobile Augmented Reality as teaching materials. Of the few that have been reviewed journals concluded with Augmented Reality Mobile usage will increase student motivation, student interaction in learning, interest in student learning and students' understanding of the subject matter and student learning outcomes [11,17,25,26].

4.2. User response mobile augmented reality
Results of the study were discussed regarding the use of Mobile Augmented Reality response as teaching materials, from journals have been in the study, it was found that the response to the use of Mobile Augmented Reality is very interesting and fun, and can create a new experience in understanding learning, and received a positive response from users [5,9,12,26,27].

5. Conclusion
Augmented Reality can help students learn to be more independent and add its own experience with lack of facilities and the design of instructional materials that are relevant at this time. In this paper explores the journal of the AR as teaching materials published in the journal database: Science Direct, the IEEE (Institute of Electrical and Electronics Engineers) and Google Scholar. The method used in some journals has been implementing in the form of questionnaires, interviews, experiments, observation, and post-test adjusted for the purpose of research. Implementation of augmented reality as an ingredient include cognitive, effective and psychomotor impacting on the ability, understanding, motivation, response, and the results of student learning of the content and media used. Of the 20 articles in the review dominated the study of higher education/university. Overall use of Augmented Reality positive impact for users in learning activities learning in all levels of education.

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