

# Utilization of Digital Augmented Reality (AR) Technology in Elementary School Education

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## Abstract

Augmented Reality (AR) digital technology is a technology that combines two-dimensional and three-dimensional objects that are displayed in real life in elementary schools. AR can help visualize digital technology in elementary school education. AR is designed to provide more detailed information to users from real objects. AR is a media that functions as one of the media and technologies for elementary school education.

AR is one of the intermediaries between educators and students in elementary school education in utilizing AR digital technology so that in its implementation it uses AR digital technology. The use of AR digital technology can shape students' mindsets in thinking critically about problems that occur in the surrounding environment. The nature of using AR digital technology helps students in the elementary school education process so that use of AR can be directly provided both outside and within the elementary school education process.

This research uses a qualitative research approach. Qualitative research defined by Bodgan and Taylor in Moleong, states that qualitative research produces descriptive data in the form of written or spoken words from people and observable behavior. Based on this expert opinion, the researcher used a qualitative research approach in carrying out the research. Qualitative research in the field of education is research that aims to determine the use of augmented reality technology in education in elementary schools so that learning objectives can be achieved. The results of research on the use of AR digital technology in elementary school education show very good results and are suitable for use as a learning intermediary between educators and students, both in class and independently. The results of research on the use of AR digital technology to help students in the elementary school education process, students' responses to the use of digital technology in learning are very good. Students are enthusiastic about participating in learning and arouse students curiosity.

## Introduction

The use of Information Technology (IT) in the process of conveying information is experiencing rapid development. Currently, the newest technology used to convey information is Augmented Reality (AR) technology. With AR technology, users can visualize historical objects or objects in 3 dimensions. AR has the advantage of being interactive and real at all times so that AR is widely implemented in various fields. In the education sector, AR is used as a medium to introduce audio-visual and non-visual media.

In line with the development of information technology, educational institutions are starting to innovate in teaching and learning activities. An important new innovation is needed in the world of education because with this new innovation the quality of education can be improved. Teaching and learning activities in each educational unit are expected to be based on technology, (Gatot S. Dewa Broto, 2017).

Augmented Reality is an exclusive system in the field of information technology. Augmented Reality (AR) is a real and virtual basic system (Atmajaya and Dedy, 2017). Augmented Reality applications have been applied in various fields, where Augmented Reality is used as an application concept that is used to combine the physical world (real objects) with the digital world, without changing the shape of the reality object.

An interactive learning system that utilizes Augmented Reality (AR) learning media technology has never been used in elementary schools where it has not been facilitated so this is something new for elementary school students. Even though we have used learning media, learning media such as 2D images do not meet the criteria for good learning media.

So research into the use of Augmented Reality that has been designed is very important, as a facility and learning medium for displaying 3D objects and animations through the use of technology that needs to be developed, so that it no longer sounds foreign, and few are familiar with its use. The use of augmented reality technology in elementary school education can provide increased experience in the learning process. Through this facilitated learning process, elementary school students can be more interactive and participate in learning better

## Methods

This research uses a qualitative research approach. Qualitative research defined by Bodgan and Taylor in Moleong (2007: 4) states that qualitative research produces descriptive data in the form of written or spoken words from people and observable behavior. Based on this expert opinion, the researcher used a qualitative research approach in carrying out the research. Qualitative research in the field of education is research that aims to determine the use of augmented reality technology in education in elementary schools so that learning objectives can be achieved.

Qualitative research is research that is descriptive and tends to use analysis. Process and meaning (subject perspective) are more emphasized in qualitative research. The theoretical basis is used as a guide so that the research focus is in accordance with the facts in the field. Apart from that, the theoretical basis is also useful for providing a general overview of the research setting and as material for discussing research results.

## Result

Utilization of Augmented Reality Technology in education in elementary schools. The steps are as follows following:

### 1.1 Augemented Reality

Augemented Reality is a technological innovation of interaction between humans and technology, which can be used to attract the interest of users. Augmented Reality works by inserting virtual objects into real objects, allowing users to see the results simultaneously. Augmented Reality has several characteristics, such as combining 3D virtual objects and real objects, and can be interacted with at the same time.

Augemented Reality is also a new form of human and machine interaction that brings new experiences to its users. The advantage of Augmented Reality is that it can create the effect of computer animated images in the real world. The Augmented Reality application uses a webcam which will detect the markers that

have been created and display a combination of real images and animation. The webcam is used as the 'eye' of Augmented Reality technology to detect markers then process them and produce virtual interactions that appear on the screen in real time.

The use of Augmented Reality Technology innovation in elementary school education creates an effective learning atmosphere and provides an overview of the real world environment in a computer-based learning system. Augmented Reality is applied in the world of education because of the advantages of combining real world situations and virtual objects that can be used to overcome problems in understanding the lessons being taught.

1.2 The application of augmented reality in the field of education has the advantage of being a learning medium that has a big influence on students studying wave material and understanding waves more easily compared to those who do not use augmented reality, seen through the results of comparisons and analysis of the learning of the two types of students (Ningsih, 2015).

Augmented Reality has the ability to make students more motivated in exploring resources and applying them to real environments from various new perspectives (Kerawella et, al 2006). So Augmented Reality has an important role in the learning process because it can motivate students to learn and search for information related to learning material.

Augmented reality can also support teaching staff by providing teaching aids in the form of augmented reality to reconstruct real objects that cannot be seen with the naked eye (lahallo et, al, 2016).

1.3 The use of augmented reality technology in learning can stimulate students' mindsets in thinking critically about problems and events in their environment, because Augmented Reality can visualize or describe abstract concepts for understanding and structure of an object model (Mustaqim, 2016).

1.4 The learning objective is to utilize Augmented reality technology to support the teaching and learning process, especially in elementary schools, so that the teaching process will be more interactive and the subject matter will be easy for students to understand. By combining Augmented reality into the learning process, it is hoped that it will provide students with learning experiences about abstract concepts or ideas that may be difficult for students to understand through augmented reality technology.

## Discussion

The use of augmented reality technology in elementary school education, especially in the learning process, has great potential in increasing students' interest in learning and activeness in the classroom. This discussion section explores the implications and research findings presented in the article entitled "Utilization of augmented reality technology in education in elementary schools.

1. Improve the learning process in the classroom, so that students are more interactive and have more curiosity.

2. Visual Learning:

Augmented Reality is visual, and this visual aspect plays an important role in conveying information effectively. The use of pictures and illustrations can clarify learning concepts related to the media that students need, making it easier for students to understand them.

3. Involvement of learning facilities and student interest in learning:

Augmented Reality technology can arouse students' interest and motivation to learn. The engaging and entertaining nature of visuals and animations can turn learning into a fun experience, fostering a positive attitude towards the subject.

4. Clarity:

The study presented in the article shows that the use of augmented reality technology is effective in conveying learning to students. This is very important for students to know technology fundamentally in the learning process.

5. Accessibility and Inclusivity:



Augmented reality is accessible to a wide range of students, including those with different learning styles and abilities. This can be a valuable resource for primary school education, accommodating the diverse needs of students.

#### 6. Integration into the Curriculum:

The findings show that Augmented Reality can be integrated into the curriculum, functioning as additional material to support teaching methods in the IT field as well as the learning media used.

#### 7. Future Directions:

Future research could explore the long-term impact of combining visual and other media as it may be beneficial for the effectiveness between humans and technology in the future.

#### 8. Teacher Training:

Teachers fully utilize the potential of augmented reality facilities and the media used so that the benefits of existing facilities and media can be better as learning facilities for students.

### Conclusion

in the use of augmented reality technology are:

a. The steps for utilizing augmented reality technology are: as follows:

Augmented Reality technology that the school already has or will just be implemented in the elementary school, augmented reality technology that is being introduced to teachers and students as a facility that supports the learning process in the classroom

b. The use of augmented reality technology produced in improving education in elementary schools was developed with the following characteristics:

- (1). The augmented reality technology facilities or learning media used in the learning process are adequate for implementation.
- (2). Augmented Reality technology is intended for elementary/MI students as a learning medium that supports good learning.
- (3). Augmented Reality technology contains visuals and animations to support the learning process.
- (4). Augmented Reality technology can be used outside of classroom learning activities so it plays an important role in facilitating learning for students.

### Declaration

#### Author contribution statement

I, Elsi Oktarina, presented in the journal article entitled "Utilization of Augmented Reality Technology in elementary school education, hereby declare my contribution to this work as follows:

- (1). Concept of using Augmented Reality Technology: I compiled and described the use of augmented reality technology through visuals or animation, which can be used for the learning process of students in elementary schools.
- (2). Educational curriculum: I researched and compiled the use of augmented reality technology by involving existing curricula to facilitate learning through augmented reality technology
- (3). Educational Alignment: I ensure that augmented reality is aligned with educational goals and standards regarding education provided through IT Technology to support learning.

I hereby confirm that my contribution mentioned above is accurate and reflects my substantial involvement in the creation and utilization of augmented reality technology in school education for the purpose of the article. I take full responsibility for what is presented and acknowledge that these statements are made in good faith.

### **Funding statement**

Research project covering the use of augmented reality technology in education in elementary schools which aims to describe and understand the use of augmented reality technology in education in elementary schools. This effort includes increasing students' interest in learning in the process

I make this statement with full transparency and understanding that my personal statement is accurate regarding the research and use of augmented reality technology presented in the article.

### **Data availability statement**

I, Elsi Oktarina, author of the journal article entitled "Use of Augmented Reality Technology in elementary school education", hereby provide the following Data Availability Statement:

- (1). Data Sharing: All relevant data and materials related to this research, including the implementation of augmented reality technology in elementary schools
- (2). Availability Period: The Statement and Description will be available for a period of five years from the date of publication of this article.
- (3). Request Procedure: Researchers, educators, or interested parties who wish to access this statement can contact me directly via email at [oktarinaelsi0@gmail.com](mailto:oktarinaelsi0@gmail.com). Requests will be processed promptly, and access will be granted for legitimate research and educational purposes.
- (4). Terms of Use: Access to statements and descriptions is subject to the condition that such statements and descriptions will be used for non-commercial and research/educational purposes only. Users are expected to provide appropriate attribution to the original work as described in the article.
- (5). Data Transparency: I am committed to promoting data transparency and reproducibility in research. Therefore, I encourage fellow researchers and educators to reach out and utilize these resources to better understand the science and purpose of utilizing augmented reality technology.

I certify that this Availability Statement and description accurately reflect the availability and conditions for access to materials related to the research presented in the article.

### **Declaration of interests statement**

I, Elsi Oktarina, author of the journal article entitled "Utilization of Augmented Reality Technology in elementary school education", hereby declare the following regarding potential conflicts of interest:

- (1). Financial Interests: I have no financial interests, affiliations, or financial holdings that could be construed as a potential conflict of interest with respect to the research presented in this article.
- (2). Commercial Affiliations: I have no direct commercial affiliations, sponsorships, or relationships with any organization or entity that may benefit financially from the publication of this research.
- (3). Intellectual Property: I declare that there are no patents, copyrights, trademarks, or other intellectual property rights associated with the comics medium or the materials presented in the article that could give rise to a conflict of interest.
- (4). Competing Interests: I have no competing interests, including but not limited to personal or professional relationships with individuals or organizations that may influence or compromise the objectivity, integrity, or validity of research findings or their interpretation.



I confirm that this Declaration of Interests Statement accurately reflects the absence of any significant financial, commercial, or intellectual conflicts of interest related to the research and publication of the article.

#### **Additional information**

I, Elsi Oktarina, am the author of a journal article entitled "Utilization of Augmented Reality Technology in education in elementary schools". Hereby provide additional information relevant to the research presented in the article:

- (1). Ethical Considerations: The research process and use of augmented reality technology is strictly based on the needs of learning facilities in elementary schools. The creation and dissemination of this educational material is carried out with the utmost respect for ethical standards and the responsible use of scientific knowledge.
- (2). Permissions and Copyright: Statements of visual descriptions, animations or images, used in augmented reality technology that are not original creations are accompanied by appropriate permission and attribution.
- (3). Acknowledgments: I would like to acknowledge the contributions and support of individuals, including educators, experts, and colleagues, who provided valuable insight, feedback, and assistance during the writing of this article.
- (4). Accessibility: Efforts have been made to ensure that the use of augmented reality technology is accessible to a wide range of audiences in order to encourage screen readers and other assistive technologies.
- (5). Use in Education: This use of augmented reality technology is intended for educational purposes, and educators are encouraged to incorporate it into their curriculum to increase students' understanding of augmented reality technology. It is available free of charge for educational use and can be obtained upon request.
- (6). Future Research: The development of educational materials is an ongoing process, and future research may focus on further refining and expanding the use of augmented reality technology as a tool in technology-based learning.

I provide this additional information to provide a comprehensive overview of the research context and to ensure transparency regarding ethical, copyright, and accessibility considerations related to the utilization of augmented reality technology.

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