



THE IMPORTANCE OF AUGMENTED REALITY (AR) MEDIA TO INCREASE INTEREST IN LEARNING AT PRIMARY SCHOOLS

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ABSTRACT

A response to the transformation in education is learning media. In order to adapt to changes in education, learning media innovation is a calculated move. Increasing student engagement and learning outcomes is influenced by the continuous development of educational media. It is expected that the integration of Augmented Reality (AR) technology into natural science instruction will improve scientific literacy, especially for elementary school pupils. Three-dimensional media makes the approach more flexible, engaging, and creative by using different items as target markers. Investigating and evaluating the use of Augmented Reality (AR) media in elementary school natural science instruction is the goal of this project. A literature review is the research methodology used, and data gathering is done using a literature study strategy. Learning outcomes and student attention have been demonstrated to be greatly enhanced by the development and application of augmented reality (AR) media in a variety of natural scientific courses. Among these subjects are the diets of animals, ecosystems, plants, and animals that go through full metamorphosis. Students are able to develop their creative faculties, assess their emotional intelligence, and grow more cooperative and competitive with their peers as a result.

Keywords: *Media, Augmented Reality (AR), Science, Interest in Learning.*

1. INTRODUCTION

According to Law 20 of 2003, "Education is a conscious and planned effort aimed at creating a learning atmosphere and learning process that allows students (pupils) to be active in developing the potential they have and the skills needed." The objectives of schooling themselves involve "religious, spiritual aspects, self-control, personality, noble character, intelligence, and skills needed by students, society, nation and state." The effectiveness of the learning process is significantly influenced by a number of elements, including the role that teachers play, the infrastructure and amenities in schools, the learning environment, and the motivation of the students. For students to fully realise their potential, they must be highly motivated and driven. In compliance with the mission of the relevant legislation, education may best prepare the next generation of highly skilled, competitive, and patriotic citizens if it is driven.

According to Aixia Ying and Wijaya (2020), technical advancements have a significant impact on global development. The same thing takes place in the field of education, where incorporating technology into the teaching and learning process in the classroom presents new difficulties (Hernawati & Jailani, 2019). Technology is a useful and productive tool for creating educational content (Wijaya Purnama & Tanuwijaya, 2020). Technology is widely used in education nowadays because it may enhance the quality of instruction. The requirement for adequate infrastructure and facilities to facilitate high-quality education is growing (Maritasari DB, 2018). It is therefore believed that adding the right technological touch to learning materials will boost students' curiosity and aptitude. Augmented reality technology is one tool that can help with science learning, particularly for subjects with abstract concepts.

The primary goals of augmented reality technology development in the context

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of educational media are to improve learning process efficacy and inspire students to comprehend abstract concepts. In order to create learning tools, augmented reality technology works by real-time image detection through the camera on specific devices. Based on the identification of certain markers, virtual information in a variety of formats—including sound, video, and two- and three-dimensional images—is displayed.

This study intends to demonstrate the potential of augmented reality as a useful learning tool for raising students' motivation to learn as well as the significance of utilising it to stimulate interest in studying natural sciences (IPA) at the elementary school level. In addition, this study assesses student answers as markers for comprehending the application of augmented reality technology in the classroom. Researchers gathered a variety of publications and papers pertinent to the application of augmented reality in learning media and student learning motivation in order to investigate the potential of augmented reality in inspiring students and comprehending their reactions to this learning medium.

The results of the conducted literature research indicate that learning materials utilising augmented reality (AR) hold great promise for improving the efficiency of science instruction in elementary schools. To fully assess the usefulness of augmented reality learning materials in the context of science instruction in elementary schools, more study is necessary. The effectiveness of AR learning media in piqueing primary school kids' interest in learning can be influenced by a number of aspects, one of which being the medium's own quality (Vishnu et al., 2023). It is anticipated that superior AR learning materials would offer pupils the best possible learning environment.

2. LITERATURE REVIEW

1) Augmented Reality (AR) Media

In the teaching and learning process, learning media serves as a channel of communication between teachers and students. It can establish connections, impart knowledge, and convey messages in an

efficient and effective manner to meet learning objectives. According to Atsani (2020), the kind of media that is used to enhance learning greatly influences how effective it is, hence using media in the teaching process is crucial.

Technology known as "augmented reality" combines 2D or 3D virtual things and shows them in circumstances that are current or occurring right now. A technology known as augmented reality (AR) combines virtual components with the actual world in an interactive way. With the use of this technology, virtual things in two or three dimensions can be integrated with the physical world and immediately projected or presented.

The newest technological advancement, augmented reality (AR), has a lot of potential for use in educational settings. By displaying virtual items in a real world, augmented reality (AR) media can serve as a substitute learning medium that offers instructional content in three-dimensional (3D) format. AR technology's primary benefit is in its capacity to facilitate interactive manipulation of virtual objects, so enabling students to engage and view course material firsthand. "A more engaging and difficult learning experience is promised when augmented reality is used in the classroom, boosting participation from students and aiding in their comprehension of abstract ideas. In addition, using augmented reality (AR) helps reduce misconceptions, boost cooperation, motivate children to study, and make it simpler for them to observe small items. Accordingly, AR technology has a tremendous deal of potential to improve how well students learn in the classroom (Ardani S. Chandra & Isnani JF 2023). One benefit of using augmented reality in the classroom is that it can help pupils memorise information more easily because they are more likely to participate in hands-on activities or special

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practice than in passively absorbing it." (Puspita I. Sari et al., 2023).

Utilising Augmented Reality (AR) technology in educational materials can help students develop their critical thinking abilities when it comes to a variety of real-world issues and scenarios. With the help of these learning resources, students can study on their own whenever they need to, with or without the assistance of an instructor. AR makes it possible to objectively and clearly illustrate abstract ideas, which improves student comprehension and helps them organise their learning in accordance with predetermined learning goals. Many students acknowledge that using augmented reality (AR) in science classes has a significant positive impact on their ability to comprehend and retain scientific material as well as support their unique learning preferences. In addition, augmented reality helps kids study by increasing their concentration and igniting their imaginations and creativity (Maulana Iwan et al., 2019).

Clear and proportionate 3D visuals, an eye-catching display design, comprehensible language, and an orderly arrangement characterise the structure of AR media. By doing this, we want to prevent student boredom and boost their enthusiasm for AR learning resources. Students' learning has been enhanced by the use of augmented reality in scientific classes at the primary school level, as it makes the material more engaging and joyful. This not only makes learning more engaging for kids, but it also helps them grasp the content more quickly and adds new dynamics to the learning process. In addition, using augmented reality (AR) can assist students learn how to focus, which will improve their ability to participate and pay attention in class (Nurnaena.S & Septi.G, 2022).

The goal of augmented reality (AR), which attempts to improve user experience

by enhancing the physical environment with virtual features, is to bring about a number of various benefits. In the sphere of education, the application of Augmented Reality (AR) technology has significantly improved the learning process. Students benefit from increased informational value as well as an engaging and dynamic learning experience thanks to augmented reality. AR provides more information access, three-dimensional visualisation, and live simulations in an educational setting. This enhances learning and memory of the material presented. By altering how teachers and students engage with the curriculum, the use of augmented reality (AR) also improves the educational process. By using augmented reality (AR), educators can create a more dynamic and engaging learning environment by allowing students to interact directly with the curriculum in a three-dimensional or image-based environment. With the use of three-dimensional models, augmented reality (AR) enables students to visually view the inside structure of human bodily organs, providing a clearer explanation of concepts that can be challenging to understand (Adam SA & Hernandez A, 2024).

As per Masri et al. (2023), the purpose of integrating Augmented Reality Media into the educational process is to establish a scenario in which an instructor is deemed exceptional if they can offer stimulating lessons, inspire both their students and themselves, and adapt to changing times, such as the Fourth Industrial Revolution. A teacher must be able to quickly adjust to cultural and technical changes in the face of the challenges of the Industrial Revolution 4.0 era. They are also encouraged to innovate, as this can greatly aid students' learning and support.

The advantages of using AR media in the learning process include the following:

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- a. Can provide a more attractive and interactive learning atmosphere to increase students' learning motivation.
- b. Clarify understanding of concepts through more realistic 3D visualization.
- c. Can improve students' ability to understand and apply the concepts they gain in practical situations.
- d. Stimulate students' creativity in producing new ideas and works.

2) Barriers to Using Augmented Reality Media in the Learning Process

There are both benefits and difficulties associated with using augmented reality media in a classroom environment. Effective time management, the requirement for human resources with expertise in the creation and use of Augmented Reality technology, and security considerations are some of the hurdles. By offering training to teachers both within and outside of the classroom, schools can enhance their effectiveness in managing the learning process. This will help to increase the calibre and performance of educators. There are still a number of barriers that prevent academic institutions from using augmented reality media as a teaching tool. These difficulties include the long development time needed for teams with specialised expertise to create and operate Augmented Reality technology, as well as the necessity for a competent staff.

Thomas P. Caudell first proposed the concept of augmented reality (AR) in 1990. Three key features define technology that carries out the augmented reality concept:

- a) The capacity to combine the digital and real worlds;
- b) The ability to provide information interactively and in real time; and
- c) The capability to display content in three dimensions.

3) Interest to Learn

The primary factor in the educational process that influences how well pupils understand the subject matter is their interest in learning. Numerous studies show a strong correlation between students' motivation and academic success and their enthusiasm in learning. The learning motivation theory states that both internal and external elements, such as a person's requirements, the learning environment, and the instructional strategies employed, can affect a student's interest in learning. A study carried out in 2019 by Ain and colleagues demonstrated that engaging and inventive teaching strategies, such as integrating augmented reality (AR) into the classroom, might boost students' motivation to learn. By displaying course information in an engaging and interactive way, augmented reality (AR) has been successfully applied in education to increase students' interest in learning. With the use of eye-catching information and 3D visual elements, augmented reality (AR) may give students an engaging and entertaining learning environment. Students' intrinsic motivation can be raised by the usage of Augmented Reality (AR) technology in the classroom, which can pique their interest in studying. Through the use of interactive and visual aids, augmented reality (AR) can pique students' interest and motivate them to participate in the learning process. All things considered, integrating augmented reality (AR) into education has a lot of potential to boost students' interest in learning by providing them with engaging, dynamic, and in-depth course materials. Teachers can build a learning environment that inspires and encourages pupils to study more assiduously and enthusiastically by successfully utilising augmented reality technology.

4) Science Learning

The intricate process of learning takes place in the classroom and involves

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interactions between teachers and students that have a reciprocal impact. This procedure may also be described as an activity that teachers have carefully thought out to help pupils learn in an efficient manner. Dynamic knowledge exchange between information producers and recipients is a component of learning activities (Ismiyanti & Neny, 2020).

The scientific field known as the natural sciences (IPA) looks at natural phenomena utilising empirical data—facts, theories, and principles that have been put to the test via extensive study. It is believed that by studying science, students will have a profound comprehension of a variety of current natural occurrences. Students receive practical experience in scientific classes, which helps them to build their understanding of absorbing, remembering, and applying the topics they study. As a result, teachers prepare children to fully, deeply, and truly learn a variety of subjects. Furthermore, it is anticipated that students will be able to explain natural occurrences they come across in the world with scientific reasoning and apply scientific ideas to their everyday activities.

Science subjects are those that actively participate in the investigation, finding, and scientific comprehension of the many natural phenomena that surround us. Therefore, learning science can be defined as an experiential process that emphasises hands-on learning to build scientific inquiry and nature comprehension abilities (Lusia Koja Kanga et al., 2022).

The four main components of IPA are, in essence, attitude, procedure, results, and application. In science, attitudes refer to a curiosity about things, the natural world, living things, and causation that prompts new inquiries that can be resolved by methodical methods. Science is a process that involves procedures for solving problems with organised scientific approaches. Numerous

facts, ideas, hypotheses, and laws gleaned via investigation and study are included in the outcomes of IPA. On the other hand, applying scientific ideas and procedures to real-world situations is known as applying science.

3. METHODOLOGY

The methodology for this study is a literature review. A literature review is a methodical procedure that gathers data from a range of sources, including books, journals, newspapers, magazines, and other materials pertinent to the development of the theory under study. Using references from books, journals, and articles helps readers understand new concepts and information from earlier research while also confirming the validity and applicability of the data used (Nurislaminingsih et al., 2020).

There are five steps that need to be followed in order while creating a literature review. First, a search was done for pertinent references and literature sources. The next stage is to assess the discovered material to make sure it is accurate and pertinent to the subject of the study. The identification of the research issue and a description of the distinctions between the situation as it actually exists and current thinking constitute the third step. The fourth phase then entails developing subsections that address the collected literature's historical, thematic, and methodological characteristics. Creating a thorough and organised literature review based on the findings of the preceding phases is the fifth and last step (Cahyono et al., 2019).

4. RESULTS AND DISCUSSION

Research findings are intended to be clarified orally by literature reviews carried out in the Scholar database, which also provide analysis in the form of tables with discussion and commentary fields. These results were achieved by classifying the data according to sections that are pertinent to the study issue under discussion. The articles will

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then be sorted according to abstracts and titles that contain the term "augmented reality." Articles that failed to satisfy these requirements were not included. A full text search was then conducted on a subset of selected publications that had the term "augmented reality" somewhere in the title or abstract. Five of the 25 publications that

highlighted the use of augmented reality in scientific instruction in elementary schools were chosen for additional examination. The analysis of these five publications' findings indicates that using augmented reality media in the classroom can boost students' enthusiasm for science.

Table 1. Article Analysis

No.	Article	Findings	Recommendation
1.	Development of Augmented Reality-Based Elementary School Science Learning Media as an Effort to Optimize Results Student Learning (Fakhrudin & Kuswidyankarko, 2020)	This newly developed media has great potential and is suitable for use in teaching. Moreover, it has been proven to significantly improve student learning outcomes in science subjects.	The implementation of the media developed is good and effective in improving science learning outcomes in elementary schools.
2.	The Influence of Augmented Reality as a Learning Media on Students' Interest in Learning Bengkulu City Elementary School Science Subjects (Oktaviani et al., 2020)	The application of Augmented Reality as an effective learning media can increase students' science learning motivation in class IV of SD Bengkulu.	The application of Augmented Reality as a teaching medium is highly recommended for educators, because it is effective in attracting students' attention, fosters an active and interesting learning environment, and makes learning more fun and enjoyable.
3.	Elementary School Solar System Augmented Reality Interactive Learning Application Using Marker Based Tracking (Aini et al., 2020)	Comprehensive testing shows that the markers can be clearly distinguished within a distance of 30-90 cm and an angle of 45 ^o -90 ^o . This validates the solar AR app's ability to function effectively in a variety of settings. In addition, a survey conducted on 10 elementary school students showed that all of them (100%) said they were positive about implementing the AR solar system as a teaching tool. This further strengthens the potential of solar system AR applications as a valuable and fun	Utilizing marker-based tracking on augmented reality-based solar system media can create a more interactive and fun learning environment for elementary school students.

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		learning medium for elementary school students	
4.	The Effectiveness of STEAM-Based Augmented Reality Learning Media in Improving the Quality of Science Learning in Elementary Schools (Muhammad Zaid, et al, 2022)	The application of STEAM-based augmented reality (AR) media in elementary school science education has shown an extraordinary positive impact. There is a significant difference in learning outcomes before and after the integration of STEAM-based AR media with a score of 0.72 which is categorized as high. These findings strongly suggest that STEAM-based AR technology can effectively improve the quality of science education.	Training and assistance is needed for teachers to optimize the use of STEAM-based AR media in learning.
5.	The Effectiveness of Augmented Reality Learning Media in Mastering the Concept of the Human Digestive System (Tri Yuliono, et al, 2018)	Research shows that the use of Augmented Reality as a teaching tool significantly increases students' mastery of the concept of the human digestive system. The posttest score (77.4) after using Augmented Reality is higher than the pretest score (50.16), which shows a significant increase in understanding	Schools and educators should consider integrating Augmented Reality technology into science education curricula, especially for teaching complex topics such as the human digestive system. This can increase student involvement and understanding of scientific concepts

After reading these five articles, it is clear that using augmented reality media to teach science in elementary schools works very well. In order to enhance students' learning experiences, augmented reality is a type of learning media that blends digital technology with real-world components like music, animation, and visuals (Randy et al., 2023). With the aid of gadgets like tablets, smartphones, or specialty eyewear, users of augmented reality (AR) can see and engage with their physical surroundings that have been enhanced with digital components. This technology can improve users' comprehension and interest in learning materials by producing experiences that blend virtual and real-world components. Teaching media are the tools or resources

used in the classroom to improve students' comprehension and mastery of the information being covered in class. (Tri & Pinkan, 2023).

The use of augmented reality (AR) on digital devices like smartphones and tablets is referred to as AR running on the Android platform (Lm et al., 2022). Android users can engage and experience AR through a variety of applications that are available on the platform. In an educational setting, the application of AR offers several benefits, including enhancing the interactivity and interest of the learning process. Because they can see 3D objects, animations, or extra information that can enhance the learning material offered, students can participate more actively in this situation.

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Additionally, employing augmented reality (AR) to visualise concepts might aid students in visualising abstract content by allowing them to view 3D models or simulations that depict the concepts being taught. This intriguing aspect of augmented reality features has the potential to boost students' motivation to learn and promote active engagement with the curriculum. Additionally, students can use augmented reality (AR) apps on their Android devices to learn independently, which helps pique students' interest in learning on their own.

Because students are more engaged and focused on improving or deepening their understanding of the material rather than just passively absorbing it, using Augmented Reality (AR) in the classroom has several benefits, one of which is that it facilitates easier process memorization for students (Noto & Joko, 2021).

5. CONCLUSION

The usage of augmented reality learning materials in the classroom has the ability to spark primary school kids' enthusiasm in learning about science. AR has many benefits, such as deepening students' understanding of course content and converting abstract material into experiences that frequently happen in everyday life. It can also boost students' passion for learning. A more thorough examination is necessary to fully understand the impact of utilising augmented reality learning media in elementary school science curriculum. Because a variety of circumstances, including the state of the learning environment, the application skills of the teaching personnel, and the availability of Augmented Reality learning materials, might affect its efficacy. Aside from that, challenges include funding for the development of Augmented Reality learning materials, internet signal stability, and Android constraints, which make it difficult to use AR learning materials in Natural Science curriculum in elementary schools. Therefore, more research is required to create high-quality Augmented Reality

learning resources that are simple for educators to implement and appropriate for the learning environment seen in primary schools.

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